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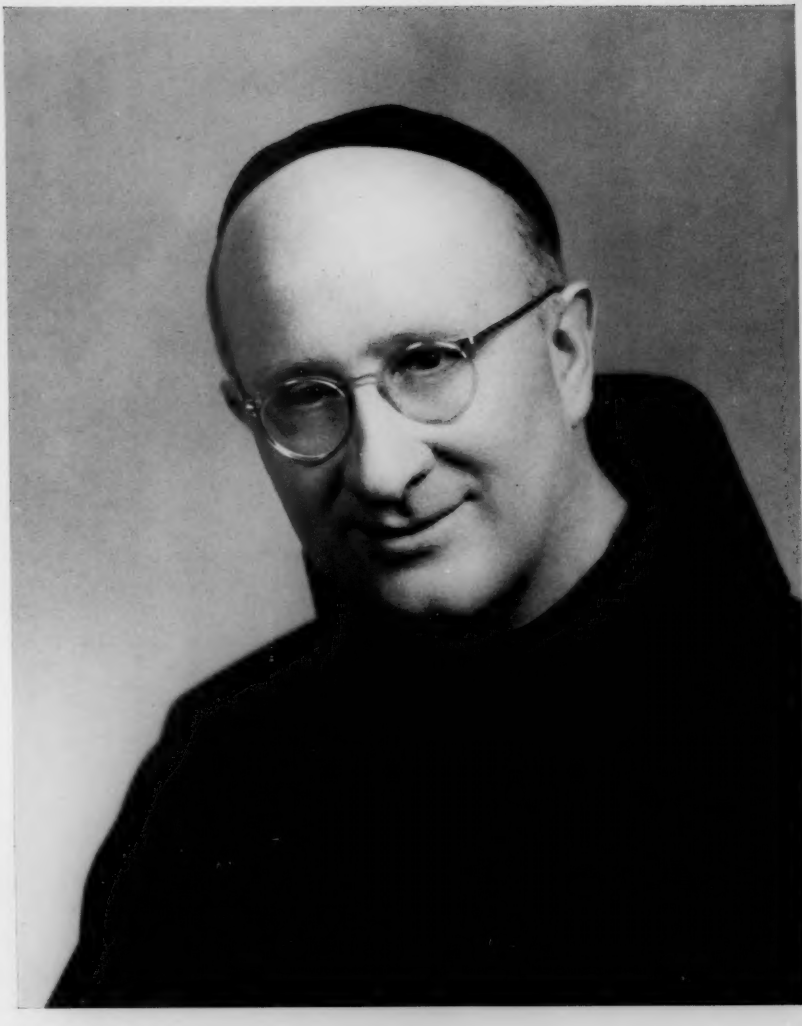

REVEREND PHILOTHEUS BOEHNER, O. F. M.
1901 — 1955

BIBLIOGRAPHY
OF FR. PHILOTHEUS BOEHNER, O. F. M.

When a prolific and versatile author does not keep track of his own writings, it is rather difficult for somebody else to establish a complete record of these publications. Fr. Philotheus did not have a list of his writings, nor did he possess a copy of everything he had published. We have tried to gather an exhaustive bibliography of his, but we fear, especially for the writings listed under rubrics III and IV, that our efforts did not fully succeed.

Statistically speaking, it appears, from our list, that Fr. Philotheus has written mainly in German and in English, occasionnally in French; he has done translations from the French into German, and from the Latin into German and English. A number of his publications were editions of Latin medieval texts. Minor articles of his have been translated into Spanish, Portuguese, Bosnian, and Lithuanian. In Philosophy he spent most of his time and efforts on medieval Logic and History of Philosophy, his preferred author being William Ockham, whereas in Biology, especially thermonasty and bryology caught his attention.

A bare list of writings obviously does not tell the entire story of the literary career of an author. In the case of Fr. Philotheus, for instance, one ought to add that the Franciscan Institute, in the short years of its existence, has published 48 volumes (cf. Appendix; 40 volumes were published before the death of Fr. Philotheus), in addition to the fifteen volumes of *Franciscan Studies* and the five volumes of *The Cord*. Fr. Philotheus was the driving power behind all these publications. He started *Franciscan Institute Publications* and *The Cord*. He reorganized *Fransciscan Studies*. He was not the first to think of publishing a collection of *Works of St. Bonaventure* in English; nevertheless, he started the series. And he began the forthcoming edition of *Opera omnia theologica and philosophica* of Ockham, for which series he did a tremendous amount of work. Besides, to picture the literary career of Fr. Philotheus, one ought to evaluate his contribution to a better understanding of reality. Posterity has to do that.

Abbreviations used: FcS: Franciscan Studies;
FIP: Franciscan Institute Publications;
FS: Franziskus-Stimmen, Werl;
FzS: Franziskanische Studien;
KK: Kirche und Kanzel, Paderborn;
SLS: Spirit and Life Series, Franciscan Institute;
SN: Sanctificatio Nostra, Kevelaer now Werl;
SS: Science Studies, St. Bonaventure, N. Y.

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100. *Kinder des Lichtes*, in FS 15 (1931) 98—101.
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102. *Kinder im Christentum*, in FS 15 (1931) 193—195.
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161. *A History of Philosophy*, Revised Edition, by B. A. G. Fuller, in FcS 7 (1947) 510.
162. *Obras de San Buenaventura*, 3 vol. edit. Biblioteca de Autores Christianos, in FcS 7 (1947) 513—514.
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171. *Le Peri Hermenias en Occident de Boèce à Saint Thomas*, by J. Isaac, in FcS 14 (1954) 325—326.
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V. APPENDIX

Chronological List of the pubications of the Franciscan Institute

1944 1. *The Tractatus de successivis Attributed to William Ockham*, edit. Ph. Boehner, O. F. M., FIP Philosophy Series 1.
1945 2. *The Tractatus de praedestinatione et de praescientia Dei et de futuris contingentibus*, edit. Ph. Boehner, FIP Philosophy Series 2.
1946 3. *The Transcendentals and Their Function in the Metaphysics of Duns Scotus*, by Allan B. Wolter, FIP Philosophy Series 3.
1947 4. *Intuitive Cognition. A Key to the Significance of the Later Scholastics*, by Sebastian Day, O. F. M., FIP Philosophy Series 4.
5. *Three Saints' Lives by Nicholas Bozon*, edit. Sr. M. Amelia Klenke, O.P., FIP History Series 1.
1948 6. Avicennae *Metaphysica*. Pro manuscripto, reproduction of the Venice edition of 1508 (Exhausted).
7. *Imperial Government and Catholic Missions in China During the Years 1784—1785*, by Bernward H. Willeke, O. F. M., FIP Missiology Series 1.
8. *From Sunday to Sunday*, by Thomas Plassmann, O. F. M., SLS 1.
1949 9. *The De Primo Principio of John Duns Scotus. A Revised Text and a Translation*, by Evan Roche, O. F. M., FIP Philosophy Series 5 (Exhausted).
1950 10. *The Negotiations Between Ch'i-Ying and Lagrène 1844—1846*, by Angelus Grosse-Aschoff, O. F. M., FIP Missiology Series 2 (Exhausted).
11. *The Eucharistic Teaching of William Ockham*, by Gabriel Buescher, FIP Theology Series 1.
12. *De corredemptione B. V. Mariae*, by Juniper Carol, FIP Theology Series 2.
13—15 Ven. Ioannis Duns Scoti *Quaestiones Quodlibetales*, 3 vol., reprint of the Wadding edition (Exhausted).
1951 16. *The Psychology of Love According to Saint Bonaventure*, by Robert P. Prentice, O. F. M. FIP Philosophy Series 6.
17. *Evidence and Its Function According to John Duns Scotus*, by Peter C. Vier, O. F. M., FIP Philosophy Series 7.
18. *Seven More Poems by Nicholas Bozon*, edit. Sr. M. Amelia Klenke, O. P., FIP History Series 2.

19. Walter Burleigh, *De puritate artis logicae [Tractatus brevior]*, edit. Ph. Boehner, O. F. M., FIP Text Series 1 (Exhausted).
20. William Ockham, *Summa Logicae*, Pars Prima, edit. Ph. Boehner, O. F. M., vol. I, FIP Text Series 2, vol. I.

1952 21. *The Psychology of Habit According to William Ockham*, by Oswald Fuchs, O. F. M., FIP Philosophy Series 8 (Exhausted).
22. *The Concept of Univocity Regarding the Predication of God and Creature According to William Ockham*, by Matthew C. Menges, O. F. M., FIP Philosophy Series 9.
23. *The Revelations of Margaret of Cortona*, by Bishop Ange-Marie Hiral, O. F. M., SLS 2.

1953 24. *Theory of Demonstrations According to William Ockham*, by Damascene Webering, O. F. M., FIP Philosophy Series 10.
25. *The Category of the Aesthetic in the Philosophy of Bonaventure*, by Sr. Emma Jane M. Spargo, Holy Names Sisters, FIP Philosophy Series 11.
26. Peter Aureoli, *Scriptum super Primum Sententiarum*, vol. I, edit. Eligius M. Buytaert, O. F. M., FIP Text Series 3, vol. I (vol. II in press; vol. III—VIII will follow).
27. Guidonis de Orchellis *Tractatus de Sacramentis* ex eius Summa de Sacramentis et Officiis Ecclesiae, edit. Damian and Odulph Van den Eynde, O. F. M., FIP Text Series 4.
28—29 Henry of Ghent, *Summae quaestionum ordinariarum*, Reprint of the 1520 edit., FIP Text Series 5, vol. I—II.
30. St. John Damascene, *Dialectica*, Version of Robert Grosseteste, edit. Owen A. Colligan, O. F. M., FIP Text Series 6.
31. *Examination of Conscience According to Saint Bonaventure*, by Ph. Boehner, O. F. M., SLS 3 (almost exhausted; new edit. in press).
32. *In Journeyings Often*, by Marion Habig, SLS 4.
33. *The Legend and Writings of Saint Clare of Assisi*, by Ignatius Brady, O. F. M. and Sr. M. Frances Laughlin, C. M. I. C., SLS 5.

1954 34. William Ockham, *Summa Logicae*, Pars Secunda et prima Tertiae, edit. Ph. Boehner, O. F. M., FIP Text Series 2, vol. II.
35. *The First Gospel, Genesis 3:15*, by Dominic J. Unger, O. F. M. Cap., FIP Theology Series 3.
36. *Transiency and Permanence. The Nature of Theology According to St. Bonaventure*, by George H. Tavard, A. A., FIP Theology Series 4.
37. *The Upper Room*, by Thomas Plassmann, O. F. M., SLS 6.
38. *The Priest and the Gospel*, by Martin Wolter, O. F. M., SLS 7.
39. *The Book of Life*, by Allan B. Wolter, O. F. M., SLS 8.

1955 40. Gregorii Ariminensis *Super Primum et Secundum Sententiarum*, Reprint of the 1522 Edition, FIP Text Series 7.
41. Saint John Damascene, *De fide orthodoxa*, Versions of Burgundio and Cerbanus, edit. Eligius M. Buytaert, O. F. M., FIP Text Series 8.
42. Walter Burleigh, *De puritate artis logicae tractatus longior, With a Revised Edition of the Tractatus Brevior*, edit. Ph. Boehner, O. F. M., FIP Text Series 9.

43. Henrici de Werla O. F. M. *Opera omnia*, vol. I: *Tractatus de immaculata conceptione B. V. Mariae*, edit. Sophronius Clasen, O. F. M., FIP Text Series 10, vol. I (vol. II—IV will follow).
44. *Spiritual Exercises According to Saint Bonaventure*, by Dominic Faccin, O. F. M., transl. Owen A. Colligan, O. F. M., SLS 9.
45. *John Duns Scotus, A Teacher for Our Times*, by Béraud de Saint-Maurice, transl. Columban Duffy, O. F. M.
46. *Where Caius Is and Other Poems*, by Sr. Mary Francis, Poor Clare, SLS 10.
47. Saint Bonaventure's *De Reductione artium ad theologiam*. A Commentary With An Introduction and Translation, by Sr. Emma Therese Healy, Sisters of Saint Joseph, Erie, Pa.; Works of Saint Bonaventure 1.
48. *Mary in the Franciscan Order*. Proceedings of the Third National Meeting of Franciscan Sisterhoods, Nov. 26—27, 1954. Volume III.

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PORTIO SUPERIOR AND *PORTIO INFERIOR RATIONIS* IN THE WRITINGS OF ST. BONAVENTURE

Like all the other thinkers of the thirteenth century, St. Bonaventure fell heir to a mixed philosophic tradition constituted by elements of Aristotelianism, Neoplatonism, and Augustinianism; and, in the spirit of the age which inspired most, if not all, of the important philosophers and theologians of the time, he attempted to put all three elements in the service of theology. Aristotle's notion of abstraction, Avicebron's theory of spiritual matter and plurality of forms, St. Augustine's doctrine of illumination — all these and more can be found in the rich corpus of St. Bonaventure's writings.

This vast complexity of St. Bonaventure's sources, is brought out most strikingly by a study of the doctrine of *portio superior* and *portio inferior rationis*, which appears many times in his works. The purpose of this paper, however, is not simply to indicate his sources, but also to show how he mastered them by developing an idea without ever departing from its original inspiration.

St. Bonaventure's principal source in the question of *portio superior* and *portio inferior rationis* was undoubtedly St. Augustine, who speaks at length upon the two parts of the reason or of the soul in the *De Trinitate:* the higher part of the soul has its gaze, as it were, fixed upon the eternal reasons and draws from them its wisdom; the lower part of the soul is turned towards exterior, material things, and, through the science it acquires, guides man in the practical affairs of life[1]. St. Augustine himself seems to have drawn the idea from Plotinus or from the neo-Platonists who, following Plotinus, held that every soul has two parts: "Something of the lower on the body side, and something of the higher on the side of the Intellectual Principle[2]." St. Augustine's theory re-

[1] St. Augustine, *De Trinitate*, XII, 2. Migne, *Patrologiae cursus completus*, series latina (hereafter cited as PL): 42, 999.

[2] Plotinus, *Enneads*, IV, 8, 8. Translation of S. MacKenna, *Plotinus* (London, 1921—1930), III, p. 153.

appeared successively, in different forms, in the works of Isaac de Stella[3], Alcher[4], Richard and Hugh of St. Victor[5], and probably influenced many of the famous twelfth century commentators on Boethius, whose distinction between *ratio* and *intelligentia* often bears a startling resemblance to St. Augustine's distinction between the two parts of the soul[6]. The theory also passed directly from Plotinus into the history of Arabian philosophy, for the mediaeval Arabian philosophers were heavily influenced by a work called *The Elements of Theology*, which they thought was Aristotle's and reverenced accordingly. In reality, this work was by a neo-Platonist, deeply indebted to Plotinus and the *Enneads*[7]. Avicenna's division of the power of the soul into *virtus sciendi* and *virtus agendi* was undoubtely inspired by the *Elements*[8], and the Latin translation of Avicenna's *De anima* by a remarkable coincidence describes each power as a *facies animae* — a term used by St. Augustine

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[3] Isaac de Stella, *De anima*. PL: 194, 1879: Posita ergo in medio, anima aliquam cum utroque habere debet convenientiam, et cum summo in suo superiori, et cum imo in suo inferiori.

[4] Alcher, *De spiritu et anima*, xi. PL: 40, 783: Et dividit se ratio in duo, scilicet in seorsum et deorsum; sursum in sapientiam; deorsum in prudentiam; quasi in virum et mulierem, ut vir sit superior et regat, mulier inferior et regatur.

[5] Richard of St. Victor speaks of an *aspectus intelligentiae* directed towards higher beings and of the *aspectus animae* concerned with knowledge of corporeal things. See his *De gratia contemplationis*, I, 3. PL: 196, 67. Compare also St. Augustine's statement, "Quandoquidem de ipsis corporalibus quae sensu corporis sentiuntur . . . si bene, ut eam notitiam referat ad finem summi boni . . ." (*De Trinitate*, XII, 12. PL: 42, 1007) with Hugh of St. Victor's "Dispositae sunt virtutes aliae inferiores, aliae superiores, ut ab inferioribus ad superiora ascendendo participes tandem fiat summi boni . . ." (*Expositio in hierarch. coelest.*, IX. PL: 175, 1104).

[6] See, for example, the anonymous manuscript contained in Wilhelm Jansen, *Der Kommentar des Clarenbaldus von Arras* (Breslau, 1926), p. 7*: Res ergo in sua immutabilitate . . . comprehendere summa quidem est sapientia. Ideoque dictum est sapientiam esse comprehensionem veritatis rerum quae sunt, id est, quae in sui natura immutabiles sunt. St. Augustine describes the object of the higher reason as follows: Ea quae nec fuerunt, nec futura sunt, sed sunt . . . sine ulla mutabilitate temporum (*De Trinitate*, XII, 14. PL: 42, 1010). The distinction between *ratio* (whose object was material) and *intelligentia* (whose object was immaterial) was so closely associated with the distinction between *ratio superior* and *ratio inferior* that when St. Thomas came to treat the latter in his *De veritate*, three of the objections in his article are concerned with *ratio* and *intelligentia*. See *De veritate*, q. 15, a. 1, objections 7, 8, and 12.

[7] E. R. Dodds discusses the authorship and sources of this work in his introduction to Proclus, *The Elements of Theology* (Oxford, 1933). In this edition, see propositions 188, 191, 192, 196, 209, and 211. For the influence of Pseudo-Aristotle's *Theologia* on Arabian philosophy, see G. Quardi, *La philosophie Arabe dans l'Europe médiévale* (Paris, 1947), p. 11.

[8] See Avicenna, *De anima*, I, v (Venice, 1508), 5 rb. For the influence of Plotinus on Avicenna's psychology, see A. M. Goichon, *La philosophie d'Avicenne* (Paris, 1944), pp. 41—42, 48—49.

himself to describe the two parts of the reason[9]. The introduction of a modified form of Avicenna's theory and of the terminology *duae facies animae* into Franciscan philosophy and theology during the Middle Ages is well-known and has been treated elsewhere[10]. Algazel (1058 to 1111) repeated Avicenna's theory in his own work, *Metaphysica;* and the translator of this work (as well as of the *De anima* of Avicenna), Dominicus Gundissalinus, clearly indicates in his translation that he personally associated the *duae facies animae* of Algazel with the higher and lower parts of the soul spoken of by St. Augustine: "Anima vero humana habet duas facies, unam ad partem superiorem . . . et aliam faciem ad partem inferiorem, scilicet ad regendum corpus[11]," — thus translating the doctrine of Algazel in terms that clearly echo the doctrine and terms of St. Augustine. The Arabian and Augustinian versions of this theory had long since found their way to Paris when St. Bonaventure began his study of the liberal arts there, probably between 1236 and 1245.

The very terminology used by St. Bonaventure when explaining what is meant by *portio superior* and *portio inferior rationis* in his own writings indicates the many sources from which he consciously or unconsciously drew his doctrine. At times he speaks of the two-fold "regard" of the soul *(duplex aspectus animae)* — a term used very often by Augustine in this matter[12], as well as by Richard of St. Victor[13]. Again, when treating the habits proper to the *portio superior* and *portio inferior*, St. Bonaventure describes them as "sapientia quae est desursum, et alia quae est deorsum" — an unmistakable echo of Alcher's

[9] St. Augustine, *De Trinitate*, XV, 7. PL: 42, 1065: Si sola anima cogitetur, aliquid eius est mens, tamquam caput eius, vel oculus, vel facies . . . See also *De diversis quaestionibus LXXXIII*, xlvi. PL: 40, 30: Anima vero negatur eas intueri posse, nisi rationalis, ea sui parte qua excellit, id est . . . quasi quadem facie vel oculo suo interiore atque intelligibili.

[10] J. Rohmer, "Sur la doctrine franciscaine des deux faces de l'âme," *Archives d'histoire doctrinale et littéraire du moyen âge*, II (1927), pp. 73—77.

[11] Algazel, *Metaphysica* (in *Liber philosophiae*, Tr. IV, ch. 5). Cited by Georg Bülow, *Des Dominicus Gundissalinus Schrift . . .*, (Beiträge zur Geschichte der Philosophie des Mittelalters, Band I, Hefte 2—4. Münster, 1895.), p. 126, f. n. 1.

[12] For St. Augustine's definition of *ratio* as an *aspectus animi*, see *De immortalitate animae*, vi. PL: 32, 1026: Ratio est aspectus animi quo per seipsum non per corpus verum intuetur. See also *De quantitate animae*, xxvii. PL: 32, 1065: Ille mentis aspectus quem rationem vocamus . . .

[13] Richard of St. Victor speaks of the two *aspectus* of the soul in *De gratia contemplationis*, I, 3. PL: 196, 67. St. Bonaventure uses this terminology many times. See, for example, his *De donis Spiritus Sancti*, coll. ix, n. 2. Quaracchi edition (hereafter cited as QU): V, 499: Unus aspectus eius est ad coelestia et invisibilia, alius est ad terrena et corruptibilia; ita est etiam duplex affectus animae: unus est aeternorum, et alius est temporalium. Sic est etiam sapientia, quae est desursum, et alia, quae est deorsum.

phrase in the same connection, "sursum in sapientiam, deorsum in prudentiam . . .[14]"

He also refers to the "eye of the mind", *(oculus mentis)*, — a favorite phrase of St. Augustine and used many times by him to describe the higher part of the reason[15]. St. Bonaventure even fuses another favorite phrase of St. Augustine's, namely, *acies mentis*, with the *intellectus possibilis* of the Aristotelian tradition, and speaks of the *acies intellectus possibilis*[16]. He similarly makes use of the term *facies animae* — a term used by St. Augustine, as well as by Avicenna, Algazel, and Dominicus Gundissalinus in relation to the two parts of the soul[17]. He occasionally uses the term *supremum animae*, a term which bears a faint but unmistakable resemblance to the term *principale mentis* employed by St. Augustine to describe the higher part of the soul and which was ultimately derived, it seems, from the Stoic tradition represented by Poseidonius and Chrysippus[18]. His own favorite terminology, however, was simply *portio superior* and *portio inferior*, as it was also the favorite terminology of St. Albert the Great[19].

St. Bonaventure was, of course, aware of the many terms that had been used and were being used to describe the various powers and

[14] Alcher, *De spiritu et anima*, vi. PL: 40, 783: Et dividit se ratio in duo, scilicet in seorsum et deorsum: sursum in sapientiam; deorsum in prudentiam. See citation from St. Bonaventure in f. n. 13 (above).

[15] St. Bonaventure, *In III Sent.*, d. 15, a. 2, q. 3, concl. (QU: III, 340): Perturbatio illa solum tangit potentias inferiores et nullo modo tangit oculum mentis . . . Cf. St. Augustine, *De diversis quaest.* LXXXIII, xlvi. PL: 40, 30.

[16] St. Bonaventure, *In II Sent.*, d. 24, p. 1, a. 2, q. 4, ad 5 & 6. (QU: II, 570). Cf. St. Augustine, *De Trinitate*, XII, 14. PL: 42, 1010.

[17] St. Bonaventure, *Comm. in Ecclesiasten*, ch. 8, v. 1 (QU: VI, 65): Facies enim animae est superior portio rationis, qua nata est videre Deum. Hanc faciem commutat solus Deus . . . Cf. Avicenna, *De anima*, I, v. (Venice, 1508), 5 va: Anima nostra habeat duas facies, faciem scilicet deorsum ad corpus . . . et aliam faciem sursum versus principia altissima . . . Algazel (see foot-note 11 above); Gundissalinus, *De anima*, ch. 10 (edited by J. T. Muckle, *Mediaeval Studies*, II:1940), p. 86: Quae duae vires sive duo intellectus sunt animae rationali quasi duae facies; una quae respiciat deorsum ad regendum suum inferius quod est corpus . . . et aliam qua respiciat sursum ad contemplandum suum superius quod est Deus.

[18] St. Bonaventure, *In II Sent.*, d. 8, p. 2, q. 2, concl. (QU: II, 226): In anima namque humana idem est intimum et supremum; et hoc patet, quia secundum sui supremum maxime approximat Deo, similiter secundum sui intimum; unde quanto magis redit ad interiora, tanto magis ascendit ut unitur aeternis . . . Cf. St. Augustine, *De Trinitate* XIV, 8 (PL: 42, 1044): Nunc vero ad eam iam pervenimus disputationem, ubi principale mentis humane, quo novit Deum vel potest nosse, considerandum suscepimus, ut in eo reperiamus imaginem Dei. Tertullian ascribes the doctrine of the *principale mentis* to the Stoics in his *De anima*, chapter 15 (PL: 2, 668). See also G. Verbeke, *L'Evolution de la doctrine du pneuma du Stoicisme à S. Augustin* (Louvain, 1945), pp. 33 ff.

[19] St. Albert, *Summa theologiae*, II, tr. 15, q. 93, m. 3, sol. (Borgnet edition: 33, 204).

functions of the soul, and, in his commentary on the *Sentences*[20], he attempted to arrange them in some kind of a definite order; but, by this time, the terminology had become too complex to be reduced to any fixed meanings, and, in his later writings, he also was forced to use terms in a somewhat different sense than that which he described in this passage in the *Sentences*.

This preliminary sketch of his terminology indicates how bulky and cumbersome the theory of the two parts of the reason had become when St. Bonaventure came to incorporate it into his own philosophical and theological reflections. Far more important, of course, is the actual use he made of it.

II

St. Bonaventure's first extensive treatment of *portio superior* and *portio inferior* occurs in his commentary on the *Sentences* of Peter Lombard, which dates around 1250[21]. Faithful to the tradition of St. Augustine, he insists here that the distinction between the *portio superior* and *portio inferior rationis* is a distinction neither of faculties nor of natures but simply a distinction between functions or dispositions of the intellect. The upper portion of our reason gazes upon the eternal reasons, and, in doing so, it is cleansed, illumined, and made perfect: "purgatur, et illuminatur, et perficitur" — a phrase borrowed, of course, directly from the *De coelesti hierarchia* of pseudo-Dionysius[22]. But the lower portion of our reason, being unable to gaze upon the eternal reasons, turns towards the world of matter, and, as a consequence, is weakened interiorly. In order to carry out properly its function of directing man in his active life, it must draw upon the strength of the *portio superior* and the wisdom which the latter obtains through its contemplation of the eternal reasons. The division between the *portio superior* and *portio inferior* should not, however, be understood in a material sense, as though the reason actually had parts. The reason is but one. As it is turned towards the eternal reasons and interiorly strengthened, it is called the *portio superior*. As it is turned towards the things of the earth and thus weakened, it is called the *portio inferior*[23]. Even the fact that the lower portion of the reason is guided by the higher portion does not argue for a real distinction between the two, for, since

[20] St. Bonaventure, *In II Sent.*, d. 24, p. 1, a. 2, q. 3, concl. (QU: II, 566).
[21] E. Longpré, "St. Bonaventure," in *Dictionnaire d'histoire et de géographie eccl.*, IX, p. 747.
[22] St. Bonaventure, *In II Sent.*, d. 24, p. 1, a. 2, q. 2, concl. (QU: II, 564). Cf. pseudo-Dionysius, *De coelesti hierarchia*, II (Migne: *Patrologiae cursus completus*, series graeca: 3, 165).
[23] St. Bonaventure, *ibid.*

our reason is a spiritual faculty, it can reflect upon itself and, consequently, it can be said to exercise dominion over itself without implying any division or interior distinction of parts[24].

Can the upper portion of the reason, which is so intimately related with the eternal reasons, commit a sin? St. Augustine seems to teach that the higher part of the reason does not sin in itself. It sins only when its gaze is turned away from the eternal reasons through the influence of the lower part of reason[25], and in this point he was following the original teaching of Plotinus, who held that the upper part of the soul was entirely sinless[26]. St. Bonaventure, however, departs somewhat from this notion, asserting that the *portio superior* can sin even without being affected by the action of the *portio inferior*. The judgements of the upper portion of our reason, he writes, can be determined, not only by the light of the eternal laws or by attractions arising from the *portio inferior*, but also by its own natural light, which has been considerably obscured by original sin. Hence, if the *portio superior* follows its own light, it can easily fall into sin. Let us suppose, he continues, that the doctrine of the Holy Trinity is proposed to a certain individual. Now, the object proposed absolutely transcends the powers of man's reason. Consequently, were the *portio superior* to rely only upon its own light in such circumstances, it would have to refuse its assent. It would err and commit a serious sin[27]. At first sight, this teaching seems quite strange; for it is difficult, if not impossible, to see how any sin could be committed under such circumstances. Is it not unreasonable to expect that the "natural man", i. e., man deprived of the light of grace, should accept the doctrine of the Trinity? St. Bonaventure would be among the first to agree. But his point is that, since grace is always present when the mysteries of the faith are proposed[28], a sin would be committed by the reason through refusing this grace and following, instead, its own natural light. Moreover, St. Bonaventure continues, the very powers of reflection which the higher reason possesses are subject to abuse, for it can reflect too much upon itself and thus turn its gaze away from the eternal reasons. When it does this, it literally becomes a law unto itself, instead of seeking guidance from the laws that rule reality[29].

[24] *Ibid.*, ad 3 (QU: II, 564).
[25] St. Augustine, *De Trinitate*, XII, 12 (PL: 42, 1007).
[26] Plotinus, *Enneads*, I. 1. 12.
[27] St. Bonaventure, *In II Sent.*, d. 24, p. 2, a. 1, q. 1, concl. (QU: II, 575).
[28] St. Bonaventure, *In III Sent.*, d. 25, a. 1, q. 2, ad 6 (QU: III, 541): Divina gratia omnibus praesto erat.
[29] *In II Sent.*, d. 24, p. 2, a. 1, q. 1, ad 4 (QU: II, 575): Ad illud quod

St. Bonaventure's next discussion of the *portio superior* occurs when he takes up *synderesis*. Although Rosenmöller asserts that St. Bonaventure was the first to distinguish the two[30], this had actually been done many times before. As a matter of fact, St. Bonaventure's teaching on this point is practically the same as that of Alexander of Hales (c. 1170—1245), and the arguments which he uses in favor of a real distinction between *portio superior* and *synderesis* greatly resemble the arguments used by his great Franciscan predecessor[31].

Synderesis, St. Bonaventure insists, is a natural, instinctive inclination to the good, whereas the *portio superior* is not instinctive but deliberative, and, for that reason, is closely associated with our power of free choice. Moreover, as an instinctive inclination to good, *synderesis* can be said to be infallible and sinless, whereas the *portio superior* can both err and sin. Finally, the *portio superior rationis* is concerned only with our relation to God; *synderesis*, however, is concerned also with our relation to our neighbour. In summary, then, our *portio superior* is a knowing power whose primary function is to contemplate the eternal reasons, but *synderesis* is a dynamic force of the will directing our entire moral life[32].

The theory of *scientia* and *sapientia*, which played an extremely important part in the historical development of the doctrine of the higher and lower reason, played an important part also in the writings of St. Bonaventure[33]. For St. Bonaventure, however, there were four kinds of science, two of them speculative, two of them practical. Two of them depend on faith, two of them do not. First of all, he writes, there is speculative science based simply on the principles and findings of reason. Then there is practical science based on the principles of the natural law. Added to these are two "supernatural" sciences: the speculative science of the Sacred Scriptures, and the active or practical science contained in the "gift of science" granted by the Holy Spirit[34]. Wisdom is also divided into four types, two of them being natural, two

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obiicitur, quod ratio superior intendit legibus aeternis, dicendum quod iste est actus nobilissimus superioris partis; sed non semper hunc actum exercet, immo etiam intendit sibi et ad se convertitur, et sic potest nimie ad se converti, ac per hoc a Deo averti et deviare a legibus aeternis.

[30] B. Rosenmöller, *Religiöse Erkenntnis nach Bonaventura* (Beiträge zur Geschichte der Philosophie und Theologie des Mittelalters, Band XXV, Hefte 3—4. Münster, 1925), p. 60.

[31] Alexander of Hales, *Summa theologica*, I—II, inq. IV, tract. I, sect. ii, q. 3, c. 2 (QU: II, 493).

[32] St. Bonaventure, *In II Sent.*, d. 39, a. 2, q. 1, sol. (QU: II, 910).

[33] See author's article, "*Ratio Superior* and *Ratio Inferior:* The Historical Background," *The New Scholasticism* XXIX (1955), 1—32.

[34] St. Bonaventure, *In III Sent.*, d. 35, a. 1, q. 2, sol. (QU: III, 776).

of them supernatural. The two natural virtues of wisdom are, first of all, a general knowledge of all things (both human and divine), and, secondly, a profound knowledge of only what is eternal. The first of the supernatural virtues of wisdom is a reverential knowledge of God that inspires worship; the second supernatural wisdom is the highest and most precious form of wisdom, for it consists in an experiential knowledge of God — in the gift of supernatural wisdom itself[35]. The four types of science are proper to the *portio inferior*, the four types of wisdom are proper to the *portio superior*.

Reason, St. Bonaventure adds, has two characteristic movements: one "upwards" to higher causes, another "downwards" to lower causes. "In our inquiries, we may proceed in two ways: either aided by the light of faith, and it is thus that we proceed when we consider higher causes, or aided simply by our own powers of judging, and it is thus that we proceed when we consider inferior natures and causes, acquiring science through our senses and experience[36]." The first type of inquiry, namely that which relies upon the light of faith, is proper to "Doctores Catholici"; the second type is proper to the "Philosophi", who do not look for God when they search for the ultimate causes of things but are instead content with what are actually secondary causes in nature. This latter kind of knowledge must be supplemented by faith and by the action of the *portio superior rationis:* in other words, natural science must be supplemented with supernatural wisdom[37].

It should not, however, be concluded from this passage that St. Bonaventure held that the human reason left unaided by faith could know nothing about God. Such a conclusion will not stand, for he very clearly asserts the contrary in other passages of his works[38]. St. Bonaventure's point here is simply that for absolutely certain and comprehensive knowledge of the relation between God and creation the philosopher must cease being a philosopher and begin to be a theologian. St. Bonaventure is not an anti-intellectualist; he is simply a realist on this point.

[35] *Ibid.*, d. 35, a. 1, q. 1, concl. (QU: III, 774).

[36] *In II Sent.*, d. 30, a. 1, q. 1 (QU: II, 716): In inquirendo dupliciter potest procedere: aut prout est adiuta radio fidei, et sic procedit aspiciendo ad causas superiores; aut prout iudicio proprio relicta est, et sic procedit inspiciendo ad naturas et causas inferiores: acquirit enim scientiam per viam sensus et experientiae . . .

[37] *Ibid.*

[38] E. g. *De mysterio Trinitatis*, I, a. 3, ad 1 (QU: V, 50): Ipse enim intellectus intra se habet lumen sufficiens ex propria conditione, per quod dubitationem istam longius propulsare et se ab insipientia eripere. The "insipientia" is the "stupidity of atheism". In the same article — in reply to the fourteenth objection — he writes: Si intellectus humanus de natura propria nihil de Deo cognosceret, excusare se posset per ignorantiam (QU: V, 51).

The passage is, however, indicative of a general tendency in St. Bonaventure to transform the natural virtue of *sapientia* as described by St. Augustine into a supernatural virtue. This is also indicated by his position that the supernatural gift of wisdom is the only wisdom that can be called wisdom in the fullest sense of the word[39].

During the years 1253 and 1254, St. Bonaventure composed his famous commentaries on the *Gospel of St. John* and the *Book of Ecclesiastes*. Each contains but a few passing references to the *portio superior* and *portio inferior* — none of them being of any special significance. Far more important to our problem is the *Quaestiones disputatae de scientia Christi*. Its date has not been determined with any exactness, yet it seems clear that it was composed between 1253 when St. Bonaventure was received into the faculty of the University of Paris and 1257 when he left Paris, having been elected Minister General of the Franciscans. In other words, it was composed shortly after his commentary on the *Sentences*[40].

In the immensely important fourth question of this work, "Utrum quidquid a nobis certitudinaliter cognoscitur, cognoscatur in ipsis rationibus aeternis[41]," St. Bonaventure discusses the problem of whether or not all that is known with certainty must somehow be known by means of the eternal reasons. In support of the affirmative position, he cites (among others) Origen, St. Augustine, St. Ambrose, St. Anselm, and Isaac de Stella. One of the affirmative arguments given — without any reference to its source, although it obviously comes from the Augustinian tradition — is as follows: the lower portion of the mind has its origin in the higher portion. Deriving, as it were, its being from the higher portion, the lower portion must also derive its knowledge from it as well. Hence, the knowledge of the eternal reasons possessed by the higher portion is the basis of the knowledge had by the lower portion. As a matter of fact, the argument continues, knowledge of the eternal reasons comes first to the soul and is more connatural to the soul than is knowledge of material, temporal things. The conclusion drawn is that it is impossible for the mind to know anything without being helped by the *portio superior*'s knowledge of the eternal reasons[42]. It is this position, namely, that nothing can be known with certainty unless it is known

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[39] *In III Sent.*, d. 35, a. 1, q. 1, concl. (QU: III, 774): Quarto modo dicitur sapientia magis proprie, et sic nominat cognitionem Dei experimentalem; et hoc modo est unum de septem donis Spiritus Sancti.

[40] E. Longpré, *loc. cit.* (See foot-note 21 above).

[41] St. Bonaventure, *Quaest. Disp. de scientia Christi* (QU: V, 17).

[42] *Ibid.*, IV, arg. 27 (QU: V, 20).

in light of the eternal reasons, that St. Bonaventure makes his own in the *corpus* of the article. His own central argument, however, is somewhat different. To possess knowledge that is absolutely certain, he states, the element of nobility must be found in both what is known and in the faculty that knows. But no nobility, in the strict sense of the word, can be found in the created things we know, for their very being is changeable, liable to corruption. Moreover, there would be no nobility in a human knower were it not for the *portio superior* of the mind — its higher part, which is a true image of God. Consequently, both of the elements necessary for certitude can be had only when the higher part of the mind knows or defines all created things through the eternal reasons[43].

St. Bonaventure then makes a significant departure from the neo-Platonic tradition on the value of contemplation. Although he taught, with Plato and Plotinus, that contemplation of the eternal ideas is possible only because the higher part of the soul has a certain affinity with them[44], nevertheless he insists that contemplation itself is not responsible for the soul's further transformation into a more faithful image of God or for the soul's progress in contemplation, as Plato and Plotinus had held. Granting the *portio superior*'s initial likeness to God, St. Bonaventure stresses rather the need of sanctifying grace for any significant advancement in the soul in its way to becoming a "truer" image of God; and, as our *deiformitas* increases — the result of grace — then our knowledge of the eternal ideas becomes more profound. In this sense, *deiformitas* may be said to be an antecedent condition of advanced contemplation according to St. Bonaventure; it is not the result of it as Plato and Plotinus held[45].

Yet no matter how much the *portio superior* advances in its knowledge of the eternal reasons, it never reaches a stage wherein it might be said to have knowledge that is specifically the same as that which it will have when it finally possesses the beatific vision after death. The eternal reasons as known during one's life are in no way to be identified with the divine essence, for what the soul knows directly in this life are simply created terms of God's dynamic influence upon the mind, i. e. special

[43] *Ibid.*, IV, concl. (QU: V, 24): Sicut ad plenum iudicium rationis deliberativum in agendis non sufficit portio inferior sine superiori, sic et ad plenum rationis iudicium in speculandis. Haec autem portio superior est illa, in qua est imago Dei, quae et aeternis regulis inhaerescit et per eas quidquid definit certitudinaliter iudicat et definit; et hoc competit ei, in quantum est imago Dei.

[44] Plato, *Republic*, VI, 490 b 4; Plotinus, *Enneads*, IV, 8, 8; III, 8, 6; St. Bonaventure, *Quaest. disp. de scientia Christi*, IV, concl. (QU: V, 24).

[45] St. Bonaventure, *ibid.*

objects or forces guiding the soul to truth[46]. Thus, the knowledge of God possessed by the *portio superior* is always indirect, general, and analogous[47].

Besides the eternal reasons, St. Bonaventure adds, there is another necessary pre-requisite for knowledge if it is to be absolutely certain. This is a special divine illumination — not a grace, nor the same as God's general influence upon creatures, but a "medium tenens inter utramque viam," enabling the mind to know the eternal reasons. It is granted only to those creatures who are images of God; and man is an image of God precisely because of the *portio superior* of his reason[48].

When St. Bonaventure came to treat the *portio inferior* of the reason in the *De scientia Christi*, he was faced with a special problem. For St. Augustine, whose traditional teaching St. Bonaventure clearly wished to continue, the lower part of the reason had for its object material things with definite relations to space and time. The *scientia* proper to this part of the mind, therefore, was unquestionably a science of the singular; and it was for this reason that St. Augustine placed the knowledge of history in the lower part of the mind but mathematics, which is concerned with universal essences, in the higher part[49]. Now, St. Bonaventure's theory of abstraction precluded a science of the singular. For him science was necessarily a knowledge of what is universal. He thus was forced by the logic of his own position to depart somewhat from the original theory of St. Augustine, but he did so without violating the essentials of St. Augustine's doctrines by simply making the *portio inferior* the seat of universal knowledge that has been abstracted from phantasms, while reserving to the *portio superior* universal knowledge drawn from the eternal reasons themselves[50]. The difference, however, between the *scientia* which is proper to the *portio inferior* in St. Bonaventure and the *scientia* proper to the lower part of the reason in St. Augustine should not be overlooked.

[46] *Ibid.*, IV, ad 16 (QU: V, 25). See also *In Hexaëm.*, coll. 4, n. 1 (QU:V, 349); *In I Sent.*, d. 17, p. 1, a. 1, q. 4, concl. (QU: I, 301).

[47] For an excellent detailed account of the *rationes aeternae* (beyond the scope of the present paper), see J. M. Bissen, *L'Exemplarisme divin selon saint Bonaventure* (Paris, 1929), p. 218.

[48] *De scientia Christi*, IV, concl. (QU: V, 23) See also E. Gilson, *La philosophie de saint Bonaventure* (Paris, 1943), pp. 274—346.

[49] St. Augustine, *De Trinitate*, XIII, 19 (PL: 42, 1033); XIII, 2 (PL: 42, 999).

[50] St. Bonaventure, *Quaest. disp. de scientia Christi*, IV, concl. (QU: V, 24). Faced with the same problem, St. Thomas solved it in a similar way by making the objects of the *ratio inferior* those things which are made immaterial through the action of the agent intellect, and reserving to the *ratio superior* those things that are immaterial in themselves. See his *De veritate*, q. 15, a. 2, corp., ad finem.

The rest of St. Bonaventure's teaching in the *De scientia Christi* on the nature of the *portio inferior* is in a far more Augustinian vein. All of the judgements of the *portio inferior* are admittedly provisory, because the final judgement with respect to the nature of any created object is reserved to the *portio superior*. In other words, in order to obtain absolute certainty and validity for its judgements, the *portio inferior* must refer all its data to the *portio superior*, which, as it were, re-judges it in light of the eternal reasons[51]. On the other hand, the *portio superior* cannot operate normally without the aid of the *portio inferior*, for the created principles of knowledge possessed by the latter are a necessary means of knowledge. Without these created principles, the mind cannot know at all, unless a special revelation is granted to it[52]. It should be noted that St. Bonaventure assigns even the principles of demonstration to the *portio inferior* on the grounds that taken in themselves they are based upon created existence. Yet, he is careful to add, the principles of demonstration have a double aspect. As related to created existence, they are the object of the *portio inferior*, and thus possess only relative certitude; but in so far as they can be and must be ultimately referred to the eternal reasons, they are the object of the *portio superior*. Then, and then alone, do they possess absolute certitude[53].

But if, as St. Bonaventure admits, absolute certitude can be had only by means of the eternal reasons, how can it be said that the *portio inferior* possesses a degree of certitude sufficient for the Aristotelian concept of science which he had adopted as his own and made a virtue proper to the lower part of the reason? In order to answer this problem, St. Bonaventure again found a solution, which, while not being inconsistent with the broad lines of his own teaching, was nevertheless sufficiently faithful to the concept of science which he had taken over from Aristotle. In a certain sense, he explains, it may be said that through *scientia* the lower part of the reason actually does know the eternal reasons (the created terms of God's action upon the soul), but it does not know them *as* eternal reasons. In the movement of the mind called science, the eternal reasons are actually drawing and leading the mind higher to a gradual realization that it is in the presence of God and under His influence. As long as this realization does not take place, the reason remains at the stage of science, and the certitude which it has,

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[51] St. Bonaventure, *ibid.*, IV, ad 12 (QU: V, 25).
[52] *Ibid.*, concl. (QU: V, 24).
[53] *Ibid.*, ad 23 (QU: V, 26).

though not absolute, is nevertheless true certitude since it is based on true causes. When the desired realization does take place, however, science is replaced by the contemplative activity known as wisdom or *sapientia*. Scientific certitude is replaced by sapiential certitude. The certitude which the mind formerly had, though adequate in itself, is seen to have been actually *derived* certitude. The knowledge which it now has is based upon absolute being and unchangeable truth[54].

The most important passages concerning the *portio superior* and *portio inferior* in St. Bonaventure's teaching occur in the *Quaestiones disputatae de scientia Christi* and in his commentary on the *Sentences* — the passages we have studied above. Reading the works that were written after the *De scientia Christi*, one cannot help but be struck by the fact that even the terms *portio superior* and *portio inferior* appear at only rare intervals. In the *Breviloquium*, which was written during the early period of St. Bonaventure's life (around 1254), the terms *portio superior* and *portio inferior* appear only a few times[55]. As a matter of fact, when in this work he comes to treat the infused virtues and their place in the soul, we find St. Bonaventure abandoning the terms *portio superior* and *portio inferior* — the terms he had used in connection with this problem in his commentary on the *Sentences*[56] — and reverting to the older terminology used by Avicenna and John of La Rochelle, namely, *facies superior* and *facies inferior animae*[57]. The *facies superior*, St. Bonaventure writes, is an image of God; but, because of man's fall, it must be corrected through grace and directed more firmly to that after which it is modelled, namely, the Holy Trinity. Elevated thus by grace, its proper virtues are the theological virtues of faith, hope, and charity[58] The *facies inferior* also must be strengthened and corrected by the cardinal virtues of prudence, temperance, fortitude, and justice[59] The basic doctrine, however, is the same as that in St. Bonaventure's commentary on the *Sentences*[60]; only the terminology has been changed.

The magnificent *Itinerarium*, another work written after the commentary on the *Sentences*, similarly contains no extensive treatment

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[54] *Ibid.*, ad 19 (QU: V, 26).

[55] The most important text in the *Breviloquium* occurs in II, 9 (QU: V, 227).

[56] St. Bonaventure, *In II Sent.*, d. 39, a. 2, q. 3 (QU: II, 915); *In III Sent.*, d. 37, a. 2, q. 3 (QU: III, 828).

[57] Avicenna, *De anima*, I, v (Venice, 1508), 5 va; John of La Rochelle, *Summa de anima*, I, ch. 43. (See also footnote 10 above).

[58] St. Bonaventure, *Breviloquium*, V, 4 (QU: V, 256).

[59] *Ibid.*

[60] *In II Sent.*, d. 39, a. 2, q. 3 (QU: II, 915).

of the *portio superior* and *portio inferior rationis*[61]. Only rarely is there an echo of the doctrine, as when St. Bonaventures describes the soul's ascent to God and speaks of "Our mind in which the divine image is reflected . . . where, like a candelabrum, the light of truth is reflected on the surface of the mind, in which the image of the most Blessed Trinity gleams forth[62]." In a later treatise, *De decem praeceptis* (1267), St. Bonaventure again makes no extensive use of the notion of *portio superior* and *portio inferior;* and, even more surprisingly, there is no mention of it in the *De donis Spiritus Sancti* (1268), for in this work there were numerous occasions when a description of the *portio superior* and of its role in the life of grace and contemplation would surely have been included if St. Bonaventure had considered the *portio superior* and *portio inferior rationis* to be an integral part of his thought[63].

In the *Hexaëmeron*, written in 1273, St. Bonaventure seldom mentions the *portio superior* or *portio inferior*, although he does speak of the *acies mentis*, a term which was sometimes used by St. Augustine to signify the higher part of the mind[64]. For example, St. Bonaventure declares that the *acies mentis* must be rectified and strengthened by faith[65]. In the final pages of this work, however, he adopts still another phrase of St. Augustine, and speaks of the *pars inferior* and *pars superior animae* and of the manner in which they are correlated in moral action[66]. Yet these references are merely in passing; and, as a matter of fact, it can be said that in none of the works after the *De scientia Christi* is there anything like an extensive use of the doctrine of *portio superior* and *portio inferior rationis*. The *De scientia Christi*, it must be remembered, was written while St. Bonaventure was still teaching in Paris[67]; hence, it seems that after St. Bonaventure left the academic atmosphere of Paris where the theory of *portio superior* and *portio inferior rationis* was being discussed, he gradually lost his former interest in it.

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[61] The *Itinerarium* seems to have been written around 1259. See E. Longpré, *loc. cit.* (footnote n. 21 above).

[62] *Itinerarium*, c. 2, n. 1 (QU: V, 303): In mentem scilicet nostram, in qua divina relucet imago . . . ubi ad modum candelabri relucet lux veritatis in facie mentis, in qua scilicet resplendet imago beatissimae Trinitatis.

[63] For example, there is no mention of the *portio superior* or *portio inferior* in the description of the three motions of the soul, i. e., towards the body, towards itself, and towards God. See *De donis Spiritus Sancti*, coll. 8, n. 13 (QU: V, 496).

[64] *In Hexaëmeron*, coll. 3, n. 4 (QU: V, 343). Cf. St. Augustine, *De Trinitate*, XII, 14 (PL: 42, 1010).

[65] St. Bonaventure, *In Hexaémeron*, coll. 3, n. 9 (QU: V, 345).

[66] *Ibid.*, coll. 21, n. 8 (QU: V, 432); Cf. St. Augustine, *De duabus animabus*, c. 13 (PL: 32, 1026); *De Trinitate*, XII, 3 (PL: 42, 999).

[67] E. Longpré, *loc. cit.* (footnote n. 21 above).

III

In summary, then, it can be said that although St. Bonaventure was faithful to the essential inspiration of St. Augustine's theory of the lower and higher parts of the reason, he nevertheless extended and modified certain aspects of it. First of all, St. Augustine seems to have stressed the fact that the lower part of the reason, because of its proximity to the appetite, is the ordinary occasion of sin, for, by being too deeply engaged in or absorbed by the objects of sense, it turns the gaze of the higher part of the reason away from God and the eternal truths. St. Bonaventure supplemented this idea by asserting that the *portio superior* can sin of itself: it can prefer its own "light", its private good, to the light of God, which is a common good. The notion of sin as a preference for a private good over a common good is, of course, found in St. Augustine[68]; but for St. Augustine sin seems to have been the result of the higher part of the reason following the lower part — not of the higher part's following its own light, because in St. Augustine's theory, the only light possessed by the higher part of reason was the light it derived from the eternal truths. It is to be regretted that St. Bonaventure never describes the precise nature of the light possessed by the *portio superior*. It is not the light of the abstracting intellect, for the seat of abstract knowledge was not the *portio superior* but, as we have seen, the *portio inferior;* and it is obviously not the special light granted by God to the mind, for this light could hardly be called its own, and it is difficult to see how it could be an occasion of sin.

A second difference between the theory as outlined by St. Augustine and as later developed by St. Bonaventure concerns the nature of the virtue of science, which was proper to the *portio inferior*. St. Bonaventure was faced with an acute problem here, for his notion of science was utterly different from that of St. Augustine, because, like Aristotle, St. Bonaventure demanded of science the certitude found only in abstract principles and in the conclusions drawn from them, whereas for St. Augustine *scientia* meant simply a knowledge of singular contingent events that would gradually lead the mind to wisdom[69]. Furthermore, the

[68] St. Augustine, *De Trinitate, XII*, 12 (PL: 42, 1007): Cum ergo huic intentioni mentis, quae in rebus temporalibus et corporalibus propter actionis officium ratiocinandi vivacitate versatur, carnalis ille sensus vel animalis ingerit quamdam illecebram fruendi se, id est tamquam bono quodam privato et proprio, non tamquam publico et communi quod est incommutabile bonum...

[69] For this reason, St. Augustine asserted that the life of Christ, both as written and as lived in time, is an object of *scientia* — in this case, the science of history. Its study will lead us to a sapiential contemplation of the person of Christ, unchangeable and eternal. See his *De Trinitate*, XIII, 19 (PL: 42, 1033—34); XII, 14 (PL: 42, 1010).

certitude that would seem to be essential to an Aristotelian notion of science would in St. Bonaventure's theory have to be drawn from the eternal reasons. Hence, in order to retain the Aristotelian notion of science which he had adopted, it would seem that he would have had to make it a virtue proper to the *portio superior*, for it is the higher part of the reason, not the lower, which knows the eternal reasons; but such a position would, of course, mean abandoning the clear teaching of St. Augustine. St. Bonaventure solved this apparent dilemma, however, by making the certitude proper to science a provisional and relative certitude that becomes absolute only when finally rooted in the eternal reasons — when *scientia* is replaced by *sapientia*. Hence, *scientia* remains a virtue proper to the lower part of the reason. It possesses true certitude, although not the absolute certitude that is proper to *sapientia*[70]. The basic difference, however, between the *scientia* of St. Augustine and that of St. Bonaventure should not be overlooked.

It was, perhaps, this point, namely, that according to St. Bonaventure any science with absolute certitude must ultimately be referred to the eternal reasons that prompted Étienne Gilson to write: "Nulle distinction spécifique ne s'introduit chez saint Bonaventure entre notre connaissance théologique du Verbe et notre connaissance philosophique des idées . . .[71]" It is difficult to reconcile this sweeping generalization with not a few texts in St. Bonaventure's writings, some of which we have cited above in connection with the theory of *portio superior* and *portio inferior*, and certainly with a text in the *De scientia Christi* where St. Bonaventure clearly distinguishes natural knowledge from knowledge granted through grace, as well as knowledge had through reason from knowledge had through revelation — and the difference between these types of knowledge is certainly not one degree but of kind[72]. The philosophical knowledge of the ideas possessed by the *portio superior* is distinct from, though decidedly inferior to, the knowledge it has of them through grace and revelation. Philosophy was "scrutabilis notitia certa"; theology was

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[70] Thus St. Bonaventure approves Aristotle's stricture of Plato: Quia despecto mundo sensibili, totam certitudinem cognitionis reducere voluit ad illas ideas; et hoc ponendo, licet videretur stabilire viam sapientiae, quae procedit secundum rationes aeternas, destruebat tamen viam scientiae, quae procedit secundum rationes creatas . . . — *Sermo* IV, n. 18 (QU: V, 572).

[71] E. Gilson, *La philosophie de saint Bonaventure*. Second edition. (Paris, 1943), pp. 132—33.

[72] St. Bonaventure, *De scientia Christi*, IV, concl. (QU: V, 23): Tunc non differret cognitio viae a cognitione patriae, nec cognitio in Verbo a cognitione sapientiae, nec cognitio naturae a cognitione gratiae, nec cognitio rationis a cognitione revelationis; quae omnia cum sint falsa, nullo modo est ista via tenenda.

"credibilis notitia pia" — the truths of philosophy are known, the truths of theology are believed[73].

One final observation remains to be made. In our brief study of the doctrine of *portio superior* and *portio inferior rationis* in St. Bonaventure, we have cited relatively few works from the entire corpus of his works. This restriction has been the result, not of method, but of necessity; for the truth is that St. Bonaventure rarely mentions the *portio superior* and the *portio inferior* in his other writings, even when the nature of these writings would seem to have provided plentiful opportunity for their inclusion.

For example, the important mystical treatises such as *De triplici via (Incendium amoris)* and *Soliloquium de quatuor mentalibus exercitiis* contain no treatment whatsoever of the *portio superior*[74]. What is the reason for this omission? It cannot be said that these works which contain so many long passages on contemplation did not offer any opportunity for discussing the *portio superior*. The first chapter of the *De triplici via*, which treats meditation, as well as the third chapter, which treats contemplation, would have been ideal places for a full treatment of the *portio superior* and its relation to wisdom. But no such treatment appears. The same is true of the *Soliloquium*. The second chapter, "Quomodo anima per mentale exercitium debeat radium contemplationis convertere ad exteriora . . .," and the third chapter, "Quomodo anima per mentale exercitium debeat radium contemplationis convertere ad inferiora," would have been logical places for a development — or at least a description — of both the *portio superior* and of the *portio inferior*, but neither is found. Again, in the fourth and final chapter of the same work, entitled, "Quomodo anima per mentale exercitium debeat radium contemplationis reflectere ad superiora . . .," there is no mention of the *portio superior* or of any of its historical equivalents, even though the very wording of the subject matter to be treated clearly echoes the ancient doctrine of St. Augustine. The literary character of these writings, that is, the fact that they are treatises on mysticism and not philosophical or theological treatises, might seem to be a sufficient reason to explain why there is no lengthy discussion

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[73] St. Bonaventure, *De donis Spiritus Sancti*, coll. 4, n. 5 (QU: V, 474): Scientia philosophica nihil aliud est quam veritatis ut scrutabilis notitia certa. Scientia theologica est veritatis ut credibilis notitia pia. For a well-balanced, judicious criticism of E. Gilson's views, see F. Van Steenberghen, *Siger de Brabant* . . . (Louvain, 1942), II, pp. 459—464.

[74] *De triplici via* and the *Soliloquium de quatuor mentalibus exercitiis* can be found in volume VIII of the Quaracchi edition.

of the two "parts" of the reason; but it hardly seems a sufficient explanation of why scarcely any mention at all is made of them.

The only adequate explanation of these significant omissions would seem to be, then, that St. Bonaventure did not regard the theory of *portio superior* and *portio inferior rationis* as essential. Finding the theory prevalent in the academic milieu of Paris and a common teaching of the *magistri* there[75], he incorporated it into his own teachings but never in such a way as to make it an essential part of them. After he withdrew from the University and from the academic atmosphere of Paris, the theory appears less and less frequently in his writings. When St. Bonaventure did employ the Augustinian theory of *portio superior* and *portio inferior*, however, he assimilated it so successfully into his own thought that, despite the differences between his theory and that of St. Augustine, his own must be considered, by and large, to be a development, not a departure.

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[75] For the authority of the *magistri* at Paris, see M. D. Chenu, O. P., *Introduction à l'étude de saint Thomas d'Aquin* (Paris, 1950), pp. 114 seq.

THE ATOMIC NUCLEUS[1]

In his recent address to the Fourth International Thomistic Congress, His Holiness Pope Pius XII stressed the need of philosophers acquainting themselves with the recent advances in nuclear science. This presents something of a problem for the professional philosopher. For at no time in the long history of science, have we ever witnessed anything comparable to the vast and intensified research, in great part Government subsidized, which is being brought to bear on the study of the atomic nucleus. The primary literature is vast and not always readily available in summary accounts. This survey of nuclear physics then may be of help to the philosopher and of interest to scientists in fields other than physics.

The term nucleus was first introduced by Ernest Rutherford, the "father of nuclear physics", some forty years ago in connection with his most significant discovery, the conception of the atom as comprising a tiny but massive positively charged core surrounded by a very tenuous but relatively extensive electron structure. The development of Rutherford's concept of the atom and its integration with Planck's quantum theory of radiation by men like Bohr, Heisenberg, Dirac and Schroedinger was the principal concern of atomic physics during the first three decades of this century. With its climax in the achievement of a unified theory of quantum mechanics, accounting for the physical and chemical behavior of the atom in both elementary and compound form, the center of the theoretical physicist's interest shifted from the extranuclear electron structure, the domain of atomic physics proper, to the nucleus and the score of "elementary" particles that are born of the heart of the atom. The last twenty years consequently, has witnessed the creation and development of a distinct branch of speculative science known as nuclear physics. Its present status is akin to that of atomic physics before the discovery of quantum mechanics. A great many nuclear phenomena have been studied and classified, but to date no satisfactory theory has been devised for integrating them. Such a theory, to be adequate, should account for what we know of elementary nuclear

[1] Address given at the Fourth National Meeting of Franciscan Sisterhoods, Marian College, Indianapolis, Indiana, November 25—26, 1955.

particles, nuclear reactions and nuclear forces. And until such a theory appear, the material we intend to cover in this paper can be treated under these three topics even though the first and third overlap somewhat.

1. Elementary Nuclear Particles

It might be more exact to speak of the elementary particles of nuclear physics rather than elementary nuclear particles, since the first description implies nothing more than that such particles are objects of study in nuclear physics, whereas the latter designation intimates that the nucleus may be compounded of these elementary entities as a wall is of bricks or cinder-blocks. The latter is only partially correct, if true at all, in the sense that the physicist is wont to distinguish between the nucleons proper (the proton and neutron) which are assumed to retain their general identity within the nucleus as contrasted with neutrinos, electrons, gamma photons and mesons which have only a potential existence there and are created or annihilated in the course of changes of energy states of the nucleons in much the same way as photons are created or annihilated in connection with the energy changes of the electrons in the extranuclear structure of the atom.

Even with this qualification the title is still misleading. For the term "elementary" is used in a purely relative sense. It does not imply invariable stability, for the elementary particles listed by the nuclear scientist are almost all unstable and quickly decay into another elementary form. They are "elementary" only in as much as they do not seem to be composed in the ordinary physical or chemical sense of the word, as we would speak of an atom being composed of a nucleus and electron cloud, or a deutron being composed of a proton and a neutron, or an alpha particle of two neutrons and two protons, and so on.

The term "particle" too may be misleading unless we keep in mind that all of these "elementary entities", at least when treated enmass also exhibit wave characteristics. In fact the clear distinction between a particle and the force which acts upon it breaks down in the realm of nuclear physics. Consequently, we find listed as particles photons of radiant energy as well as certain types of mesons which seem to be a form of nuclear or intimately connected with the forces that bind nucleons together. From the wave aspect it is convenient to conceive of each of the various particles as being associated with a field of force which field may be conveniently treated mathematically in terms of

some form of wave-mechanics, that is to say, the intensity, the size and geometric shape of any given field can be described in terms of some mathematical equation. On the other hand, every field of force has its "quanta". That is to say, alterations in the intensity, size or shape of a given field do not take place continuously but by discrete jumps. The familiar example is alteration in the electromagnetic field operative between the nucleus and extranuclear electrons. Any variation in the energy of this system involves the emission or absorption of electromagnetic radiation in the form of energy "bundles" or *quanta*. In the case of the electromagnetic field and electromagnetic energy, the quantum is known as a photon or "light particle". As the late Enrico Fermi put it, "The field theories of other elementary particles are patterned on that of the photon. The assumption is made that for each type of elementary particle there exists an associated field of which the particles are the quanta. In addition to the electromagnetic field an electron-positron field, a nucleon field, several meson fields, etc. are also introduced[2]."

It is meaningless to try and describe or define these elementary particles in such familiar terms as shape, or color, or composition and so on. Instead we define the fundamental particles in terms of five physical constants, mass, electric charge, mean lifetime before decay, spin and magnetic moment[3]. The *mass* is usually expressed in multiples of the mass of the electron and is abbreviated m_e. The electric *charge* is either a positive or negative unit charge or it is zero, i. e. neutral or without charge. The mean *lifetime* is the average time such a particle exists before decaying spontaneously. With the exception of the proton and electron which are stable, most elementary particles exist only for a fraction of a second, the longest lived being the neutron which

[2] Enrico Fermi, *Elementary Particles*, New Haven, Yale University Press, 1951, p. 1.

[3] From the wave-mechanical aspect, elementary particles have another important behavior characteristic known as *intrinsic parity*. Parity is fundamentally a wave-mechanical property of a nucleus or nucleon system which depends on the total angular momentum (combined orbital and spin momentum) of the nucleons (i. e. protons and electrons) and which indicates how the wave function of the system behaves when the signs of the x, y and z coordinates are all reversed or changed from positive to negative (inversion). If the wave function changes signs but not its numerical value upon inversion, the intrinsic parity of the nucleus is said to be odd (or negative), whereas it is even (or positive) if the signs do not change. In as much as the emission or absorption of a particle by the nucleus may affect the parity of the latter, the elementary particles themselves may be said to have an odd or even intrinsic parity accordingly as they change or leave unchanged the parity of the nucleon system. Those of even intrinsic parity are said to be scalar particles; those of odd intrinsic parity, pseudoscalar.

has a mean lifetime of thirteen minutes. The *spin* of a particle is its inherent angular momentum and may be regarded as due to its rotation on its own axis. It is expressed in half-integral or integral multiples of Planck's constant h, divided by 2π, a plus or minus sign being prefixed to indicate the relative direction of the spin. The *magnetic moment* determines the torque acting on a particle when in a magnetic field. That is to say, in a magnetic field of known intensity, a measurable amount of energy will be required to change the position, let us say, of a compass needle or a bar-magnet depending on the strength or magnetic moment of the needle or bar-magnet. Nuclear particles as a rule behave as tiny magnets. Their magnetic moment is measured in nuclear magnetons, a magneton being equal to 5.05×10^{-24} erg-oersted^{-1}.

To describe the methods of measuring these quantities in the case of the elementary particles would take us too far afield[4]. We might note however that the spin of a particle is usually inferred from the particle's behavior rather than being measured directly. Particles with a half-integral spins such as the electron, proton, neutron, neutrino and muon are sometimes given the generic name "fermion" whereas those with an integral spin like the photon, or pion are called "bosons"[5].

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[4] See for example, R. M. Tennent, "Finding Out About Fundamental Particles" in *Science News*, 35 (1955), 24—41; H. A. Bethe and F. de Hoffmann, *Mesons and Fields*, vol. 2, Evanston, Ill., Row, Peterson and Co, 1955, also Bethe, "Mesons and Nuclear Forces" in *Physics Today*, vol. 7, n. 2 (Feb. 1954), 7—8.

[5] The names are derived from the particular type of quantum-mechanic statistics used to describe their behavior in a system made up of similar particles. Fermions obey Fermi statistics; bosons, Bose statistics. Those familiar with the Bohr or the quantum mechanical theory of atomic structure will recall the Pauli exclusion principle which forbids any two electrons from occupying the same energy state. Two electrons, in the same atomic orbital, for example, must differ by their spins. Stated in another way the occupied energy states of particles obeying the Pauli principle are all independent, and their wave functions are said to be antisymmetrical, that is to say, the sign of the function changes from plus to minus or the reverse whenever an odd number of particles are added to (or removed from) a system of such particles, whereas it does not change if the change involves an even number. There are fundamental particles other than the electrons which also obey the Pauli principle, for example, neutrinos, mu mesons, protons and neutrons. In 1926 Fermi developed a statistical method for expressing the kinetic energy distribution for systems of particles which cannot occupy the same energy states. Later in the same year Dirac made an important contribution to the quantum-mechanic statistics of Fermi, wherefore they are often referred to as Fermi-Dirac statistics. Two years earlier, Satyandra Nath Bose of Dacca University had discovered that in order to obtain Planck's law of radiation, we must assume that even though photons are not excluded from occupying the same energy state, the probability distribution among the various possible energy

After these general remarks we may say a word about the individual particles whose existence is recognized as sufficiently established at the time of the present writing.

a. Nucleons

Nucleon is the generic name for the proton and neutron which are considered to be the fundamental building blocks of the nucleus. The proton (symbol: p) is the nucleus of a normal hydrogen atom, having a unit positive charge and a mass of 1836.13 times that of the electron. The neutron, as the name implies, has no electrical charge and is slightly more massive than the proton, *viz.* 1838,66 m_e. At first Rutherford believed the proton to be a positive electron but when he realized that it contained almost the total mass of the hydrogen atom, he proposed its present name. At the same time (1920), he predicted the existence of the neutron (symbol: n) but the latter was not discovered until 1932 when Sir J. Chadwick who had worked with Rutherford, was able to prove that a very penetrating type of radiation produced by bombarding parafin with alpha-particles was not an extremely hard gamma-ray but was composed of neutral particles of approximately the mass of the proton. Both proton and neutron are fermions with a half-integral spin. The magnetic moment is 2.79 nuclear magnetons and that of the neutron —1.91. The negative value indicates that the direction of the magnetic moment is opposite to that of the spin. The fact that the magnetic moment of the proton is not 1 and that of the neutron 0 as might be expected from the simple form of the Fermi-Dirac theory is usually attributed to the action of the meson field surrounding the nucleons. The proton is stable, but the neutron apart from the nucleus decays into a proton, plus an electron and a neutrino after about thirteen minutes.

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states is not what one would expect from classical statistics but requires a special mathematical treatment. Bose's quantum-mechanic statistics were immediately extended by Einstein to the study of a monatomic ideal gas. As a result the quantum mechanical formulae needed to express the kinetic energy distribution of a system of particles like the photons is generally referred to as Bose-Einstein statistics. Wolfgang Pauli showed that fermions all have half-integral spins, whereas bosons have integral spins. Consequently, the wave function of a fermion or fermion system will be antisymmetrical, whereas that of a boson or system of bosons will be symmetrical in the sense that any perturbation of the system will leave the + or — sign of the function unchanged. See for instance, Dirac, *Principles of Quantum Mechanics*, 3 ed., Oxford, Clarendon Press, 1947, pp. 207—211; E. Whittaker, *History of the Theories of Aether and Electricity*, vol. 2. Edinburgh, Nelson and Sons, 1954, pp. 219—224; W. Pauli, *Physical Review*, vol. 58 (1940), 716.

In its most simplified form, the nuclei of the various atoms are pictured as being constructed of nucleons from the simplest, that of ordinary hydrogen, consisting of a single proton to the most complex known to date, the artificially produced mendelevium (element number 101) with 256 nucleons[6]. The total number of nucleons gives the mass of the nucleus in atomic mass units[7], whereas the number of protons gives the atomic number. Since the external electron structure responsible for the chemical and physical characteristics of the chemical elements depends upon the atomic number, it is still convenient to designate the nuclei by the symbol of the chemical element to which they belong, adding the total number of nucleons as a superscript. Thus O^{16} indicates a nucleus with eight protons, eight being the atomic number of oxygen, and eight neutrons, whereas O^{18} indicates an isotope of oxygen with ten neutrons. Similarly U^{235} indicates a nucleus of 92 protons and 143 neutrons, whereas U^{238} designates an isotope that differs from uranium 235 by three additional neutrons.

This method of symbolization, however, should not obscure the fact that the nucleus functions as an independent system. Its properties are dependent immediately on the number and kind of nucleons (and their energy state) and are not correlated directly with the chemical properties at all. From the standpoint of nuclear physics, uranium 235 is as radically different from uranium 238 as sodium and chlorine from the chemist's viewpoint.

Though the details of the picture are far from clear, we have every reason to believe that the structure of the nucleus is every bit as com-

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[6] Physicists generally accept the opinion that the elements in their present abundance have been built up of protons and neutrons. This process of synthesis presumably occurred at much higher temperatures than we find in the normal life of the stars and apparently suddenly broke off when the temperature dropped. Various theories of some kind of primitive "cosmic explosion" have been advanced to explain the genesis of the various elements from some highly compressed "neutron gas", but the question is still far from solved. For a review of various theories and a survey of current literature, see Alpher and Herman, "Theory of the Origin and Relative Abundance Distribution of the Elements" in *Reviews of Modern Physics*, vol. 22 (1950), 153—212; also D. ter Haar, "Cosmogonical Problems and Stellar Energy", *ibid.*, 119 ff., esp. pp. 134—142; G. Gamow, The Creation of the Universe, New York, Viking Press, 1952, esp. chap. 3.

[7] For rough measurements either the proton or the neutron may be taken as the unit of atomic mass (abbr. *a. m. u.*). However, when nucleons unite to form a more complex atomic nucleus the result is a minute loss of mass which is proportional to the stability of the respective nucleus. For the purpose of more precise measurement one sixteenth of the mass of the most common isotope of Oxygen (O^{16}) is used as the unit of atomic mass. 1 a. m. u. = 1.6603×10^{-24}. The energy equivalent of 1 a. m. u. is 931.8 Mev (million electron volts), one electron volt being equivalent to 1.602×10^{-12} ergs.

plicated as that of the more familiar extranuclear electron structure of the atom. But we shall return to this later. For the present we merely note that two distinct fields of force must be reckoned with in the nucleus[8]. The first is the *electromagnetic* field operative between the charged nucleons (protons). Variation in energy states associated with this field are responsible for the emission or absorption of gamma rays (gamma photons), even as variations in the electromagnetic field associated with the extranuclear electrons is responsible for radiation phenomena in the X-ray, ultra-violet, visible and infra-red portions of the electromagnetic spectrum.

Secondly, there is the *nuclear field* proper. This is created by the nuclear forces (of which we shall speak later) which are of a distinct nature than the electromagnetic forces. The former operate between nucleons independently of whether they are electrically charged or neutral. Variations in the nuclear field seems responsible for the productions of electrons (positive and negative), mesons and neutrinos (of which we shall speak shortly).

b. Positive and Negative Electrons

The ordinary or negative electron, also called a negatron (symbol: e^-, β, or β^-), is the unit of negative electricity. Identified by J. J. Thomson in 1897 as the particle that makes up cathode rays, the electron's charge was first measured accurately by R. A. Millikan using the oil-drop method. Recent refinements of measurement place its value at 4.8025×10^{-10} e. s. u. The electron has a rest mass of about 9.1066×10^{-28} grams. According to the theory of relativity, mass increases with velocity. In the case of the relatively light electron, which can be accelerated to velocities approaching that of light, this relativistic increase may cause the electron to have a mass many hundreds of times its rest mass. The electron is sometimes called a beta-particle, because it is emitted by the nuclei of certain radioactive isotopes (beta-emitters). This creates a problem, for as we said above, the electron does not seem to exist as such in the nucleus. If it did, it should contribute its magnetic moment and spin to the nucleus which is contrary to the evidence at hand. Furthermore, an electron confined to such a small space would have a tremendous kinetic energy (up to 10^8 electron volts), which is not in accord with our present knowledge of the nucleus. Yet the study of Wilson cloud-chamber photographs indicates that the electron to all

[8] For practical purposes we may ignore the gravitational field of force which operates between nucleons by reason of their mass.

appearance is violently ejected from radioactive nuclei which recoil in the process. Fermi suggested the now generally accepted theory that just as the photon does not exist as such in the atom, but is emitted when electrons change energy levels, so in like manner the electron (and a neutrino) are formed and emitted when the nucleus undergoes a beta-transformation.

In 1932 Carl Anderson, studying the effects of cosmic radiation, discovered the positive electron or *positron* (symbol β^+ or e^+). It appears to have the same mass as the negative electron or negatron but has an opposite or positive unit charge. Both positive and negative electrons are fermions with a half integral spin. They also possess a magnetic moment of approximately 1837 nuclear magnetons, which value is also known as the Bohr magneton[9].

Artifically radioactive nuclei in contrast to naturally radioactive isotopes, often return to a stable state by emitting a positive electron. Hence, we speak of both positive and negative beta-rays and beta-emitters. Gamma rays with energies of more than 10^6 electron volts such as secondary cosmic rays, interacting with the nuclear field of a heavy atom such as lead, produce a negative and positive electron, the process being known as electron-pair production. The positron is short-lived. It unites with a nearby electron in what is the reverse of the pair production process and is transformed into two gamma photons with a combined energy of 10^6 electron volts according to Einstein's mass-energy equation $E = mc^2$, where E is the energy in ergs, m the mass in grams and c the velocity of light in centimeters per second.

Dirac predicted the existence of the positive electron two years before its discovery by Anderson. According to Dirac's "hole" theory, negative energy states are possible for the electron, that is to say, energy levels that are less than those characteristic of the electron in a free state or even when bound in the atom. To meet the objection that electrons would be disappearing into these unobservable negative states, Dirac suggested that normally all these states are filled with electrons, and hence, according to the Pauli exclusion principle, could not be occupied. But when a high energy gamma ray raises one of these otherwise unobservable electrons from a negative to a positive energy state, the impression of the creation of an electron is produced. Im-

[9] Recent experiments indicate that the magnetic moment of the electron is actually 0.13% larger than the Bohr magneton, which is usually explained by attributing to the electron an intrinsic magnetic moment in addition to that associated with the rotating charge. Cf. e. g. W. Finkelnburg, *Atomic Physics*, N. Y., McGraw-Hill, 1950, p. 36.

mediately the other electrons drop into the vacant energy level in cascade fashion producing the effect of a "positive electron". The effect is similar to that of a bubble of air rising in a glass of water. The bubble, which is a kind of a "hole" in the water, is moved upward by being successively displaced by the heavier liquid. The same effect would take place if the gas bubble were a vacuum instead of a substance lighter than water.

c. Gamma photons

As we mentioned at the outset of this article, radiant energy (or electromagnetic radiation) has both a particle and a wave aspect. The former becomes particularly important when we enter the realm investigated by the nuclear physicist. The photon or quantum of light or electromagnetic energy is sometimes classified among the elementary particles of the nuclear physicist. Depending on the frequency of electromagnetic waves, photons differ in energy according to the formula

$$E = h\nu$$

where E is the energy measured in ergs, h is Planck's constant[10] and ν the frequency per second. On this basis, the photons with the greatest energy are the very hard (i. e. very energetic and highly penetrating) gamma rays including those which make up secondary cosmic rays[11]. Next in order come the photons of X-rays, ultra-violet, visible light, infra-red, short and long radio waves. The photons of lesser energy (ultra-violet, visible light and beyond) are produced by energy changes usually associated with the valence or outer electron structure of atom, or molecules. X-rays are produced by the energy changes of the inner planetary electrons of the heavier atoms. But gamma rays including secondary cosmic rays involve variations in the nuclear electromagnetic field arising between charged nucleons. When particles within the nucleus are excited, they move into different energy levels in much the same way as extranuclear electrons do. This results in the absorption or emission of gamma rays. Just as the absorption of sufficient energy by a extranuclear electron may cause it to leave the atom entirely (the photoelectric effect), as happens for example, when light falls on a photoelectric "eye", so also the absorption of a gamma photon by the nucleus may result in driving out a nucleon. This is known as the nuclear photoelectric effect. Hence, the nuclear reactions induced by gamma photons are treated in the same category as those produced by other particles such as the proton, deutron, alpha-particle, etc.

[10] 6.624×10^{-27} erg-second.

[11] Primary cosmic rays are not electromagnetic radiation but streams of electrically charged particles, mostly protons.

As a particle, the gamma photon (symbol: γ) obeys the Bose-Einstein statistics and hence is a "boson". As such it is considered to have an integral spin of one.

As mentioned above, gamma photons with energies in excess of a hundred thousand electron volts can be transformed into electron-positron pairs. Conversely, the positron can unite with another electron and from the annihilation of the pair two gamma ray photons with a combined energy of 10^6 electron-volts are formed. This process can be repeated over and over several times until the high energy photon has been transformed into softer gamma rays, whose energy is eventually dissipated by ionization of the atoms and molecules of the surrounding medium.

d. Neutrino and Antineutrino

The existence of the neutrino (symbol: ν) was first postulated to preserve the laws of conservation of spin and energy in radioactive disintegration processes but recently some experimental confirmation of its existence has been found[12]. Radioactive substances emitting alpha particles impart to them definite energies corresponding to the nuclear energy level the nucleons are in at the time the particle is ejected. Beta-particles, on the contrary, are emitted with all possible velocities. This is not readily understandable, if we grant that radioactivity is caused by an unstable nucleus passing from one definite excited energy state to a lower or more stable level. In order to account for this discrepancy, it was assumed that an electron or beta particle emitter releases a neutrino with the electron. Its rest mass is less than $^1/_{200}$ of the electron and probably zero and it possesses no electrical charge. Otherwise it would be detected in cloud chamber photographs of beta-emitters. In addition, if the neutrino is assumed to have one half-integral spin like the electron, it does away with another difficulty. Nuclei of odd atomic weight have a one half-integral spin. Now if such a nucleus were to emit a beta-particle or electron with zero atomic weight and a half-integral spin, we should expect to find that the remaining nucleus would still have an odd atomic weight but would now possess an integral spin. Such, however, is not the case. This is intelligible only if we presume

[12] The main evidence for the existence of the neutrino is found in the recoil phenomena accompanying beta-decay. Cloud chamber photographs reveal that the recoil af a nucleus when a slow energy electron is emitted, is much greater than expected if the electron alone is emitted and not a high energy neutrino also. More recently, large-volume liquid scintillators have revealed further evidence of the elusive neutrino. Cf. Harrison, Cowan and Reines, "Large-volume Liquid Scintillators: Their Applications" in *Nucleonics* vol. 12 n. 3 (March, 1954), 51—53.

that the departing neutrino as well as the electron carries a half-integral spin, for since their total or combined spin will be a full integral, the odd atomic mass nucleus will still possess a half-integral spin.

An unstable nucleus with an excess positive charge can become stable in one of two ways. Either it emits a positron, or it can neutralize this positive charge by obtaining an electron from the nearest extra-nuclear electron shell (viz. the K shell). In the latter case we have what is called the "K-capture". The hole left in the K shell is filled by a transition of electrons from the outer shell producing X-rays which reveal the existence of the K-capture. In spite of the fact that the electron absorbed has a half-integral spin, the total spin of the nucleus does not change by a half-integral. The principle of spin conversation would require either the ejection or capture of a neutrino. It is highly improbable however that a neutrino should just happen to be absorbed simultaneously with the K electron. More probable is the assumption that a neutrino is emitted when the electron is absorbed. The same is true if the alternative of the K-capture, viz. the emission of a positron takes place. To distinguish the neutrino emitted with the positron, or associated with the K-capture, from its mirror image, the neutrino associated with ordinary beta particle or negative electron emission the former is called an anti-neutrino (symbol: $\bar{\nu}$).

e. Mesons and Hyperons

Mesons are so called because in the scale of relative mass they occupy an intermediate position between the nucleons and the electrons. They fall into two generic classes, light mesons known as *L-mesons*, and a heavier variety known as *K-mesons*. *Hyperon* is a generic name given to a heavier type which is intermediate in mass between that of the nucleon and the deuteron[13].

[13] This classification was introduced at the International Congress on Cosmic Radiation held at Bagnères-de-Bigorre in the south of France July, 1953. Cf. E. Amaldi, etc. *Physics Today*, vol. 6, n. 12 (Dec. 1953), 24—26. For further modifications and extensions of the basic terminology introduced at this Congress, see *Proceedings of the 1954 Glasgow Conference on Nuclear and Meson Physics*, edited by Bellamy and Moorhouse, London, Pergamon Press, 1955, (see also the report on the Conference by K. G. McNeill, Nucleonics, vol. 12, n. 9, Sept. 1954, 46—49); *Proceedings of the Fourth Annual Rochester Conference on High Energy Nuclear Physics* (1954), edited by the Department of Physics, University of Rochester, p. 91; as well as the *Proceedings of the Fifth Annual Rochester Conference*, sections IV and V. See also, Bethe and de Hoffmann, *op. cit.*; P. E. Hodgson, "Fundamental Particles: The Present Position" in *Science News*, 31 (1954), 49—68, Leprince-Ringuet, "Mesons and Heavy Unstable Particles in Cosmic Rays" in *Annual Review of Nuclear Science*, vol. 3 (1953), 39—66; Dilworth, Occhialini and Scarsi, "Heavy Mesons", *ibid.*, vol. 4 (1954), 271—311.

Mesons and hyperons were first discovered while investigating the effects of the bombardement of nuclei by primary cosmic rays. But with the construction of high energy particle accelerators like the cosmotron or proton synchroton it is possible to produce them artificially. The cost of these machines becomes prohibitive however for imparting energies to protons in excess of 30,000 Mev. (million electron volts)[14], so that even the most powerful of these machines in operation or under construction at present cannot produce particles with energies comparable to those which make up primary cosmic rays where energies of thirty million Mev. have been reported. For this reason, the study of cosmic rays has played a major role in the development of what is known as "meson physics". Nevertheless, the atom smashers like the proton synchroton, despite the lower energies of the particles they produce, have the advantage of producing mesons and hyperons under accurately controlled conditions.

From a phenomenological viewpoint mesons and hyperons are classified on the basis of their method of decay as S-events and V-events. The former indicates that the decay occurs only after the meson or hyperon has been stopped (hence the S) in a cloud chamber or photographic emulsion. The V-events are those which can be interpreted as the decay of a K-meson or hyperon in flight. They are subdivided into V^0 and $V^{\pm}$ depending on whether the initial or primary particle is neutral or charged. In a neutral V-event, the two charged secondaries into which the invisible primary particle decays form two visible tracks in the cloud chamber that look like an inverted V. The decay can be shown to be spontaneous and not due to any collision. Where the primary meson or hyperon is charged, its path in the cloud chamber is visible and the V is formed when the initial particle decays into a charged and neutral secondary, only the former leaving a visible track that angles away from the first track to form a broad V.

A rather bewildering number of mesons and hyperons have been discovered to date, and with thousands of research workers probing this area of nuclear physics, it is understandable that any attempt at detailed classification is apt to be antiquated long before it is printed. In the following, we have listed those which have been generally recognized and accepted by the physicists at the Fifth Annual Rochester Conference on High Energy Nuclear Physics held at the beginning of this year (January 31 — February 2, 1955).

[14] Cf. J. P. Blewett, "Recent Developments in Proton Synchrotrons" in *Annual Review of Nuclear Science*, vol. 4 (1954), 8.

L-mesons

While the various species of hyperons are designated by capital Greek letters, small Greek letters are reserved for mesons (whether heavy or light). The light or L-mesons include the familiar pi (π) and mu (μ) mesons. Already in 1935 the Japanese physicist Hideki Yukawa, who developed and extended Heisenberg's suggestion that the binding of nucleons can be explained in terms of exchange forces, postulated that particles several hundred times the mass of the electron were involved and that they could be regarded as the quanta of the nuclear field even as photons are the quanta of the electromagnetic field. Unlike the electrically neutral photons, however, the Yukawa particles should also exist in negative and positive forms. In 1936 when C. D. Anderson and S. H. Neddermeyer of the California Institute of Technology and J. C. Street and E. C. Stevenson of the Havard University discovered the first mesons, it seemed that Yukawa's predictions were verified. Further investigation, however, revealed that these mesons (now known as mu mesons) though positively and negatively charged and of approximately the predicted mass strangely enough showed no affinity for nucleons as the Yukawa particle should. Nevertheless, attempts continued for over a decade to connect the two until in 1947 a group of Italian physicists M. Conversi, O. Piccioni and E. Pancini demonstrated that the cosmic ray meson had even less interaction with the nucleus than suspected and could by no stretch of the imagination be the Yukawa particle. A few months later the puzzle was solved when G. P. S. Occhialini, C. F. Powell and C. M. C. Lattes in Bristol, England, discovered that the mu meson is really a secondary meson which results from the decay of a primary meson which they labeled π. The latter fulfilled Yukawa's dream. It interacted strongly with the nucleus, being easily scattered and readily absorbed by the latter. And because it was generally accepted by physicists to be the particle which transmits nuclear force, it became the subject of an intensitive study unprecedented in the history of physics, and together with the mu meson constitutes the chief object of the youngest branch of the physical sciences known as "meson physics".

The principal properties of the pi and mu mesons, consequently, are rather well known and may be summed up briefly as fellows.

The *pi meson*, or pion as it is sometimes called, occurs in a neutral (π^0) as well as in positive (π^+) and negative forms (π^-). The charge of the negative pion is that of the electron, that of the positive pion is the same as the proton charge, as may be inferred from the fact that

when a charged pion interacts with a proton or deuteron, the products of the reaction reveal that the electrical charge is conserved. For instance, a positive pion and deuteron yield two protons, and vice versa. A negative pion plus a deuteron yield two neutrons and a gamma photon, and with a proton such a pion may yield either a neutron and a neutral pion, or a neutron and gamma radiation. Electrically neutral mesons, of course, lack the ionizing power of the charged variety and cannot be observed directly in cloud or bubble chambers[15] like the latter. Their existence is inferred, however, from their decay into two gamma rays. The mass of the charged variety can be determined from the deflection in a magnetic field and appears to be the same (within the margin of observational error) for both π^+ and π^-, namely $273.3 \pm 0.2\ m_e$. The mass measurements of π^0 are understandably less accurate, being inferred from the energies of the two gamma decay products, or more precisely from the mass difference in the reactions

$$\pi^- + \text{p (proton)} \rightarrow \text{n (neutron)} + \pi^0$$

Measurements such as these indicate that neutral pion is between nine and ten electron masses lighter than the charged variety. The increased mass of the latter is usually attributed to the self-energy which results from the interaction of the electric charge of the pion with the electric field applied to the cloud chamber.

The lifetime of the charged variety is of the order of 10^{-8} seconds, which is very long compared to that characteristic of most subatomic phenomena. This means practically that where the meson has been accelerated to velocities approaching the speed of light, it may travel as much as ten feet before decaying, which permits a rather accurate measurement and study of its properties. Jakobson (1951) gives 2.55×10^{-8} seconds as the mean lifetime of the positive pion. The negative is somewhat more difficult to determine as it will be readily captured by the positive nuclei if any atoms be present. Measurements, however, indicate that it is the same as that of the positive variety within the limits of observational error. The neutral variety has a short life which is difficult to determine with any great accuracy, but is estimated to be around 5×10^{-15} seconds (Anand, 1953)[16].

[15] For details of the new Glaser bubble chamber technique, see D. A. Glaser and D. C. Rahn, "Characteristics of Bubble Chambers" in *Phys. Rev.*, vol. 97 (1955), 474—479; D. A. Glaser, "Progress Report on the Development of Bubble Chambers" in *Nuovo Cimento*, vol. 11, ser. 9, Suppl. 2 (1954), 361—368; *idem*, "The Bubble Chamber" in *Scientific American*, vol. 192 (1955), 46—50; R. H. Hildebrand, "Observation of Nuclear Events in Glaser Bubble Chambers" in *Proc. of Glasgow Conference*, pp. 311—314.

[16] M. J. Jakobson, A. G. Schulz and J. Steinberger, *Phys. Rev.*, vol. 81 (1951), 894; B. M. Anand, *Proceedings of the Royal Society*, vol. A 220 (1953), 183.

While the neutral pion decays into two gamma rays, as we have indicated, the charged variety disintegrates into a mu meson of similar charge. It was this fact that led to the discovery of the pi meson by Lattes, Occhialini and Powell. The mass of the mu meson is less than that of the pion, and the conservation of mass-energy demands that this difference in mass appear in the form of kinetic energy imparted to the decay products. Experimental evidence, however, indicates that the muon has less energy than expected, and hence another invisible or electrically neutral product must be involved in the decay. Since the energy the mu received by reason of the decay remains constant, only one other decay product need be postulated. It is not a gamma photon, for the latter would cause electron pairs or showers which could be readily detected. Furthermore, the energy and momentum conversation laws require that it have a zero mass, or at most a few electron masses. Consequently, it is assumed to be a neutrino and the decay scheme of the pion can be written thus

$$\pi^+ \rightarrow \mu^+ + \nu$$
$$\pi^- \rightarrow \mu^- + \nu$$

The *mu meson*, or muon, occurs only in positive and negative varieties, so far as we know. The charge in both cases is unitary. The mass, which can be determined by several methods[17], lies close to 206.9 m_e. The lifetime has been measured with great accuracy to be $2.22 \pm 0.02 \times 10^{-6}$ seconds. Both positive and negative muons are known to decay with the emission of electrons. Since the energy spectrum of the decay electrons is continuous, that is without any fixed value as in the case of the decay products of the pion, additional electrically neutral decay products must be involved. Furthermore, whereas pions are bosons with a zero or integral spin, the muons like electrons or neutrinos are fermions with half-integral spin, and the decay scheme must account for conservation of spin. All these requirements are best satisfied if we assume that two neutrinos are involved in muon decay. Hence the accepted scheme is

$$\mu^+ \rightarrow e^+ + 2\nu$$
$$\mu^- \rightarrow e^- + 2\nu$$

Since negative pions and muons could be called "heavy electrons", it is not surprising that they can be made to replace electrons in the

[17] E. g., the range and momenta relative to the pion, the study of the electron decay spectrum, or of the energies of X-rays emitted between two Bohr orbits in a mesic atom. H. A. Bethe and F. de Hoffmann, *op. cit.*, p. 365; R. E. Marshak, *Meson Physics*, N. Y., McGraw-Hill, 1952, p. 203.

outer orbits of an atom. These atoms which consist of an ordinary nucleus, a negative meson and some electrons are known as ***mesic atoms.*** They are formed by the capture of the meson in an outer orbit followed by an energy loss either through radiation or through the ejection of an electron from the atom, the latter being known as the Auger process. Since the increased mass of the meson has the effect of making the radius of the Bohr orbit for the meson much smaller than the corresponding electron orbit for the same quantum number, the electrons will lie outside the meson orbit and have negligible influence upon the same so that the meson energy levels can be computed with a fair degree of accuracy by assuming the mesic atom resembles the hydrogen atom, or singly ionized helium, doubly ionized lithium, etc. Since the pi meson interacts strongly with the nucleus, it can be captured by the latter, in which case a proton in the nucleus will be transformed into a neutron and the mass-energy of the pion will normally be converted into kinetic energy of the nucleus causing further nuclear reactions. The muon, unlike the pion, is not strongly coupled to the nucleon, so that it will not be absorbed by the nucleus once a mu-mesic atom is formed. The mu-meson as part of the atom is an extremely useful tool for exploring the electric field near the nucleus. Deviations from the pure Coulomb potential in this field are increased by virtue of the meson's greater mass. Since the finite size of the nucleus is one of the factors responsible for this deviation, mu-mesic atoms can be used to obtain more accurate measurements of the nuclear radius. One of the first results of such investigation was to show that the nuclear radius is about 15% smaller than previously believed. Also other characteristics of nuclei can be learned from the study of mu-mesic atoms, for instance, vacuum polarization in the neighborhood of the nucleus which is responsible for another deviation in the Coulomb potential.

K-mesons

The heavy or K-mesons are those whose masses lie midway between of the pi meson and the nucleon. As a matter of fact, the K-meson mass lies generally in the neighborhood of one half the nucleon mass. Study of photographic emulsions exposed to primary cosmic-rays or those of proton synchrotrons like the 3 Bev Brookhaven cosmotron and the new 6 Bev. bevatron at the Radiation Laboratory of the University of California reveal a rather disconcerting variety of K-mesons. In many cases it is difficult to distinguish one type from another. Usually the individual varieties are denoted by small Greek letters such as the tau

(τ) and theta (θ) mesons, but they may also be designated by the group name with a subscript describing the decay product, especially when they are not fully identified. Thus K_e indicates a K-meson that decays into an electron, K_μ and K_π denote heavy mesons that decay into muons and pions respectively. Sometimes an additional number is added to show the total number of decay products. Thus $K_{\pi 2}$ indicates a heavy meson with two decay products, one of which is pion. Without claiming the list complete, nuclear physicists generally include the following in their scientific census of K-mesons: the tau, the theta, the K-pi-two, the K-mu-two, the K-mu-three and the K-e-three meson.

The tau meson (τ), first discovered in 1949, is the most investigated of all the K-mesons and hyperons. Its mass is about 1000 m_e. It occurs in both positive and negative forms, the former variety, however, appears in far greater abundance, presumably because of the greater likelihood of the negative tau being absorbed by the positively charged nuclei. Since the decay products are always coplanar, their momenta adding up to zero, we can infer that no additional neutral particle is emitted. The mass can be computed directly from the measurement of the length of the primary tracks, but a more accurate method is to estimate it from the masses and kinetic energies (75 ± 0.2) of the decay products. This yields the result of $967 \pm 1\ m_e$. The spin is integral, and the tau consequently is a boson. The decay scheme observed is

$$\tau^+ \rightarrow 2\pi^+ + \pi^-$$

although theoretical reasons (e. g. the theorem of charge independence) indicate an alternate mode of decay should be possible

$$\tau^+ \rightarrow \pi^+ + 2\pi^0$$

Similarly, the decay pattern of the negative tau would be

$$\tau^- \rightarrow 2\pi^- + \pi^+$$

or

$$\tau^- \rightarrow \pi^- + 2\pi^0$$

The lifetime is estimated to be around 5×10^{-9} seconds. Most tau-mesons observed decay at rest rather than in flight. Their production too seems to be the direct result of nuclear collisions and not of the decay of heavier particles or hyperons. Though some anomalous decay events have been interpreted as the result of a neutral tau, it is not yet clearly evident that the particle in question is not a neutral theta.

Next to the tau, the *neutral theta* (θ^0) seems the best established of the K-mesons. It decays into two oppositely charged pions with a total decay energy of 214 ± 5 Mev. Hence, the mass of the theta is $965 \pm 10\ m_e$. The lifetime is measured at 2×10^{-10} seconds. An alternative mode of

decay of the theta into two neutral pions should be possible. Because the mass of the neutral theta is close to that of the tau, some tend to consider it the neutral counterpart of the latter. However, the fact that one decays into three, the other into two pions seems to imply essentially different characteristics[18].

Recently there seems to be some evidence for a positive theta which decays into a positive and a neutral pion[19]. If it exists, perhaps it is responsible for some of the charged V-events that occur.

Reasonably certain too is the existence of the *K-pi-two* ($K_{\pi 2}$) meson, also known as the chi (χ) or charged theta ($\theta^{\pm}$), at least in its positive form, though there is also considerable circumstantial evidence for the negative variety also. The particle decays into a pion of the same charge plus a neutral pion. The mass is about 952 m_e and the decay energy 212 Mev. There is some doubt about the lifetime, which is estimated to be not much shorter than 10^{-9} seconds, possibly 10^{-8}.[20] The particle is believed to be a boson with an integral spin.

The *K-mu-two* ($K_{\mu 2}$) was discovered only last year at Paris[21] and given its present provisional designation. The accepted decay scheme is

$$K_{\mu 2}{}^{+} \rightarrow \mu^{+} + \nu$$

That the observable secondary is a muon rather than a pion is inferred from the fact that it manifests no strong interaction with nuclei. Also mass measurements are too for a pion. The neutral particle is not a neutral pion since no gamma ray showers are observed. Also the observed mass measurements do not allow for a particle that heavy. It seems, therefore, to be a neutrino. There is some uncertainty about the decay energy (235—255 Mev) and consequently about the mass (920—960m_e). This uncertainty assumes some importance when it comes to distinguishing the particle from other K-mesons of similar mass[22]. Since the spin must be conserved and the decay products have each a half-integral spin, the K-mu-two should be a boson.

The K-mu-three ($K_{\mu 3}$), formerly known as the *kappa* meson, is so called because its presumed decay is a muon plus two or more neutral

[18] We mentioned earlier (note 3) that parity can also be considered a distinguishing characteristic of elementary particles. The decay of the tau into three pions is best understood theoretically if the tau has an even spin and odd parity, where as to decay into two, the theta should have either even spin and even parity, or odd spin and odd parity. Evidence argues to the former, in which case the theta is a boson.

[19] A. L. Hodson, et alii, in *Phys. Rev.*, vol. 96 (1954), 1089.

[20] Cf. *Proc. of Fifth Annual Rochester Conference* (1954), pp. 124, 129.

[21] B. P. Gregory, Lagarrique, Leprince-Rinquet, Mueller and Peyrou in *Nuovo Cimento*, vol. 11 (1954) 292.

[22] Cf. *Proc. Fifth An. Rochester Conf.*, pp. 124, 127.

particles. Because of the variable energy of the observed muon, a three particle rather than a two particle product is postulated. The mass, estimated from the highest energy muons emitted, seems to be about 1000 or more m_e. It has been suggested that this meson may represent simply an alternate mode of decay of the K-pi-two. If the three-body decay scheme is correct, however, the K-mu-three would not be a boson but a fermion.

The *K-e meson* (also K_{e3}) is so called because the heavy meson has only one electron as its decay product, but the variable energies of the latter argue to a three body decay. Hence, the proposed decay scheme is

$$K_{e3} \rightarrow e + 2 \text{ neutrals}$$

The latter are probably neutrinos. Like the preceding, then, this should be a boson.

Other K-mesons have been reported, notably one with a mass of about 1400 m_e whose decay products have not been studied[23], and also one with a mass abound 1200 m_e which decays into a light secondary particle of high momentum[24].

Hyperons

Hyperon, or Y-particle (from the Greek Ὑπερον) is an "elementary" particle with a mass greater than that of the nucleon. The various kinds are designated by capital Greek letters. Because they were responsible for the first observed V-events, they were formerly called V-particles. Like the nucleons, the hyperons known so far are fermions with half-integral spins. Like the nucleons, they apparently exert nuclear forces and are presumably capable of emitting virtual pi mesons which are strongly coupled to them in the same way as pions and nucleons are coupled. Consequently, it is not surprising to find that before a hyperon disintegrates, it may momentarily unite with the nuclei of atoms, the binding energy of the hyperon being of the same general order as that of the nucleon. Because of this similarity nuclear physicists find it convenient to give the common name *baryon* (i. e. a heavy particle) to nucleons and hyperons.

First found among cosmic ray phenomena, hyperons can now be produced artificially. The pioneer work in this field has been done with the Brookhaven cosmotron, where 1.37 Bev. beam of negative pi-mesons was used to bombard a hydrogen filled cloud chamber. The

[23] Dilworth, Occhialini and Scarsi, "Heavy Mesons" in *Annual Review of Nuclear Science*, vol. 4 (1954), 271—311.
[24] *Ibid.*, 309.

high-energy pions would unite with the protons to form neutral lambda plus a neutral K-meson (presumably a neutral theta).

$$p + \pi^- \rightarrow \Lambda^0 + \theta^0$$

The neutral *lambda* (Δ^0) is the best investigated of the hyperons. It decays after a lifetime of $3.86 \pm 0.75 \times 10^{-10}$ seconds into a proton and negative pion with a decay energy of 37 Mev. The charge symmetry principle suggests that the decay products could also be a neutron and a neutral pion. To account for certain anomalies in the decay energy values observed in a few instances, an alternative decay scheme is assumed to exist according to which the lambda produces a proton plus a muon and a neutrino. The mass of the lambda is 2180 m_e.

The charged counterpart of the lambda[25] is the *sigma* hyperon ($\Sigma^{\pm}$) with an observed mass of 2327 m_e for the positive variety and 2325 m_e for the negative. After a lifetime of something less than 10^{-10} seconds, it decays in either of two ways.

$$\Sigma^{\pm} \rightarrow n + \pi^{\pm} + 110 \text{ Mev.}$$

$$\Sigma^{\pm} \rightarrow p + \pi^{\pm} + 116 \text{ Mev.}$$

Finally, there is the negative *xi* hyperon (Ξ^-) known sometimes as the cascade particle because it decays only through a two step cascade into a neutral lambda and negative pion. The decay energy is about 60 Mev., making its mass about 2570 m_e. The lifetime seems to be of the order of 10^{-10} seconds.

f. Anti-particles

Current theories of electrically charged particles have what is known as a symmetry property. That is to say, for each charged particle a counterpart with similar properties but of the opposite sign should exist. It was on the basis of such a theory that Dirac predicted the existence of the anti-electron or positron. Other particles obeying a Dirac-like equation such as the proton, neutron or certain types of mesons and hyperons should also have similar counterparts. In addition to the anti- or positive electron we have already mentioned the anti-neutrino. The negative muon, for instance, may be the anti-particle of the positive

[25] M. Gell-Mann and A. Pais postulate on theoretical grounds the existence of a neutral sigma which decays into a neutral lambda and a gamma photon. It is too early, however, to pass judgement on the merits of their interesting theories regarding the interrelation of hyperons. Confer their article, "Theoretical Views on the New Particles" in *Proc. of the Glasgow Conference*, pp. 342 to 352. For a general survey of the highly tentative current theories on mesons and hyperons, see H. A. Bethe and F. de Hoffmann, *Mesons and Fields*, vol. 1, Evanston, Illinois, Row, Peterson and Co., 1955.

muon, and the same may be true of some of the heavy mesons (e. g. the *kappa* meson) and hyperons.

The theoretical nuclear physicist has long accepted the assumption of anti-nucleons and has catalogued their probable properties. The negative or anti-proton, for example, should be a stable particle of the mass of the proton but with a unit negative charge and a magnetic moment equal and opposite in sign to that of the proton. The anti-neutron would resemble the neutron in its mass and zero charge but would have a positive instead of negative value for its magnetic moment. It would be unstable, decaying into an anti-proton plus a positive electron and an anti-neutrino.

The existence of antinucleons should be difficult to detect inasmuch as they would tend to annihilate themselves in collisions with ordinary nucleons due to the interaction of their pion fields even though, in the case of the anti-proton, they may be stable in isolation. Furthermore, it would be an extremely rare case where an anti-nucleon would exist as a real particle[26] because of the unusually high energies required to produce it. For theoretical considerations[27] indicate that they can only be created in pairs, and the energy to create a real, and not merely virtual, pair would be tremendous. The kinetic energy of the resulting proton-antiproton pair, consequently, would be so great that before it could be slowed down enough to be readily detected experimentally, it would probably have collided with some nucleon and would be annihilated to produce pions.

Sufficiently high energies to produce proton-anti-proton pairs however, are available in cosmic rays. During the last few months

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[26] The rapid decay of the negative pion into two gamma rays has been assumed to involve the creation of a "virtual" proton-anti-proton pair. By reason of their interaction with the electromagnetic field they subsequently annihilate each other producing the two gamma photons. Cf. E. Fermi, *Elementary Particles*, p. 76.

[27] It has become increasingly evident that to explain why certain energetically conceivable decay processes never seem to occur, and consequently why nuclear matter can be stable, some law regarding forbidden-reactions must be invoked. E. P. Wigner has emphasized the existence of such a law which he calls the "Law of the conservation of heavy particles." For nucleons, it states that in any reaction, the number of nucleons minus the number of antinucleons remains constant. Hence, nucleons and antinucleons can only be created in pairs. Like the law of the conservation of charge, it seems to hold good in all reactions. The deeper reason for either law is still a mystery. Particles which are "heavy" in this technical sense are said to have a unit "mesonic" (also called "neutronic") charge. Wigner believes this mesonic charge plays the same role for the conservation of heavy particles as the electric charge plays for the conservation law of electric charge. It also has opposite signs for particle and antiparticle. Cf. Bethe and de Hoffmann, *op. cit.*, vol. 2, pp. 45—47.

evidence has been growing that the annihilation of an anti-proton is involved in certain high altitude cosmic ray phenomena. And only a few weeks ago (Oct. 18, 1955) E. O. Lawrence conjointly with the U. S. Atomic Energy Commission announced that the team of O. Chamberlain, E. Segrè, and C. Wiegand working with the University of California's new Bevatron has produced negative or anti-protons. Using 6.2 Bev. protons to bombard copper nuclei, they were able to produce a negative and positive proton pair with kinetic energies of better than 100,000 miles a second on the average of about one every fifteen minutes.

While the discovery of the anti-proton confirms the physicist in the belief in the soundness of his general theoretical approach, he still has not found the key that will unlock the mystery of the multiplicity and the behavior of the "elementary particles" he has discovered.

2. Nuclear Reactions

By nuclear reactions we understand any change in the composition or physical characteristics of an atomic nucleus due to the capture and or emission of some subatomic particle[28]. By subatomic particle we mean anything less than the atom proper. Hence, it would include not only such "elementary particles" as the electron, proton, neutron, gamma ray photon, etc. but even atomic nuclei such as the alpha-article (helium nucleus), the deutron (nucleus of doubly heavy hydrogen), the triton (nucleus of triply heavy hydrogen), or even the nuclei of the heavier atoms such as krypton, barium, xenon, etc. which may result from spontaneous fission.

Some nuclear reactions take place spontaneously, whereas others are induced by directly or indirectly irradiating or bombarding the atoms with high-energy bullets, which may be one of the elementary nuclear particles mentioned above or the nuclei of the lighter elements. This latter process is popularly referred to as "splitting the atom". If a charged particle is emitted or absorbed by the nucleus so that its total positive nuclear charge (and hence atomic number) is altered, we have what is known as the transmutation of an element. For instance, we may change mercury into gold, thus realizing in part at least the dream of the medieval alchemist, even though the process be anything but economical. To the extent that chemistry concerns itself with the laws

[28] Nuclear reaction is taken here in a strict sense. It is sometimes given a broader meaning to include any interaction of elementary particles. Cf. e. g. J. M. Blatt and V. F. Weisskopf, *Theoretical Nuclear Physics*, New York, John Wiley and Sons, 1952, p. 311.

governing the change of one kind of matter or substance into another, nuclear reactions involving a transmutation of elements pertain to the province of nuclear chemistry. As with chemical changes, so also in nuclear reactions energy is absorbed and/or released. In general, the reaction occurs when the nucleons that compose the nucleus pass from an unstable or excited state to a more stable condition. In the case of induced reactions, the excitation energy is derived from the kinetic and/or mass-energy of the bombarding particles. In the case of spontaneous fission or radioactive decay where no outside triggering action is involved, the reaction is "explained" in terms of probability laws which permit an occasional "escape" from a condition of high internal energy to a lower or more stable state.

Some of the principal nuclear reactions usually distinguished are exchange reactions, radioactivity, fission, fusion and spallation.

a) *Nuclear exchange reactions* occur when one subatomic particle enters a nucleus and ejects one or more other subatomic particle. According to the nature of the particle bombarding or entering the nucleus exchange reactions are classified as proton induced, neutron induced, etc. or where a gamma or high energy photon is involved, photoproduction or the nuclear photoelectric effect. Another mode of classification is designate them as proton-neutron, deutron-proton, gamma-neutron reactions, etc. to indicate both the bombarding or inducing particle and also the ejected particle. Thus for example

$$S^{32}\ (n, p)\ P^{32}$$

is a neutron-proton (n, p) reaction in which a sulfur nucleus of atomic mass 32 is bombarded by a neutron and ejects a proton becoming, in the process, phosphorus 32. Similarly,

$$C^{12}\ (n, 2\ n)\ C^{11}$$

indicates a neutron-dineutron (n, 2 n) process in which carbon 12 captures one neutron but ejects two to become carbon 11. In reactions of the exchange type, evidence points to the conclusion that the process usually occurs in two steps. In the first, the incident particle is absorbed or captured by the nucleus to form a highly excited intermediate nucleus which returns to a more stable form by ejecting a particle or particles. In the preceding instance, for example, carbon 12 becomes carbon 13 before passing to carbon 11.

b) *Natural and artificial radioactivity.* Natural radioactivity was discovered accidentally by Henri Becquerel in 1896, but it was Ruther-

ford who eventually succeeded in separating and identifying the three types of radiation involved, *viz.* alpha, beta and gamma rays, and with Soddy, elaborated a theory of radioactive disintegration. All the elements above mercury (atomic number 80) have one or more naturally radioactive isotopes. These radioactive elements are arranged in series or families, each member of the series being a product of the radioactive decay of the preceding element. In addition to the three well-known actinium, radium and thorium series, with the artificial production of transuranic elements several new side chains have been added to the three families and a new radioactive series (the neptunium family) discovered. As more transuranic elements are produced in sufficient amounts that their decay pattern can be studied, we may expect the recognition of additional families or series.

Among the lighter elements, potassium 40, rubidium 87, samarium 148, and lutecium 176 have long been recognized to be naturally radioactive. With the exception of samarium (an alpha emitter), all emit beta radiation. More recently, lathanum and indium have been found to possess naturally radioactive isotopes. Lathanum 138 decays with gamma rays, probably by electron capture (K-effect) and has an estimated half-life of 1.2×10^{11} years[29]. Indium 115 is a beta emitter with a half-life computed to be 6×10^{14} years[30].

Theoretically, any element can be bombarded in such a way as to produce a radioactive isotope. The latter resemble radioactive substances in that they disintegrate spontaneously after a certain period. Most of them are beta-emitters but in many cases the electron emitted is posititve instead of a negative electron. They differ from the natural radioactive elements in that their half-life or mean lifetime is usually considerably shorter.

The distinction between natural and artificial radioactivity, however, can hardly be considered a radical or fundamental difference, particularly if we adopt generally accepted view that the heavier elements are built up step by step from nucleons or lighter elements[31]. In such a case we may reasonably presume that many more nuclear varieties than we know of today would also be formed. Such nuclei, we know, differ in stability and those with relatively short half-lives would soon dis-

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[29] Pringle, Standil and Roulsten in *Phys. Rev.*, vol. 78 (1950), 303

[30] Martell and Libby, *ibid.*, vol. 80 (1950), 977. See also Perlman and Hollander, "Radioactivity and Nuclear Structure" in *Annual Review of Physical Chemistry*, vol. 5 (1954), 132—135.

[31] See note 6.

appear from the universe leaving behind only the more slowly decaying isotopes which we label as naturally radioactive.

c) *Nuclear fission.* In exchange reactions or through radioactivity the particles ejected are relatively small compared to the total nuclear mass. Nuclear fission on the contrary represents a splitting of an atomic nucleus into two fragment nuclei of more of less equal mass[32]. The energy released in fission is tremendous compared to that associated with the two preceding types of reactions. Ordinary radioactive disintegration of uranium releases 1 to 20 Mev. whereas fission of a uranium nucleus produces about 160 Mev. Uranium, plutonium, protoactinium and neptunium are the best known of the fissible elements though all of the transuranic elements probably have one or more such isotope. The usual method of producing fission is to irradiate fissible material with neutrons[33]. Uranium 235 and Plutonium 239 used in first atom bombs are fissible by slow neutrons. Uranium 238, on the contrary, will fission only upon the capture of fast neutrons. Frisch and Meitner first developed a theory to explain fission. The capture of a neutron causes the heavier atomic nuclei, presumably ellipsoidal in shape, to become distorted like an elongated frop of liquid. When a critical point is reached, the nucleus breaks up into two smaller frops, releasing at the same time a number of neutrons. Under favorable conditions these neutrons cause further fission initiating a chain reaction in the fissible material.

Fission can also be induced in many other elements as for instance, among such medium heavy elements as copper, bromine, silver, tin or barium. Fission of tin for instance yields sodium and gallium, whereas beryllium, carbon, fluorine, sodium, chlorine and potassium have all been found as fission products of copper[34].

Spontaneous fission for the heavy elements was predicted practically as early as the discovery of neutron induced fission. Since then sponta-

[32] Actually the two principal daughter nuclei may differ considerably in mass. Such asymmetrical fission, as it is called, usually predominates if the inducing particle is of low energy, whereas symmetrical fission (where the fission yields products of equal mass) predominates at high energies. Slow or thermal neutron irradiation of uranium, for instance, favors the fragments with a mass ratio of about 3 to 2, for example, barium and krypton, or strontium and xenon. Cf. e. g. Seaborg and Templeton, "Radioactivity and Nuclear Theory" in *A. R. of Phys. Chem.*, vol. 2 (1951), 87—88; W. F. Libby, *ibid.*, vol. 1 (1950), 102—104.

[33] High energy protons, deutrons, alpha-particles or photons can also be used to induce fission. See Perlman et alii, in *Phys. Rev.*, vol. 72 (1947), 352; Kelly and Wiegand, *ibid.*, vol. 73 (1948), 1135.

[34] Cf. M. G. Mayer, "Radioactivity and Nuclear Theory" in *A. R. of Phys. Chem.*, vol. 3 (1952), 21.

neous fission has been observed to occur in uranium and thorium as well as in the transuranic elements[35]. Particle or photon fission takes place when the nucleus has been excited by some 5 Mev. or more, whereas spontaneous fission occurs from the ground or unexcited state. As anticipated this form of fission in uranium proceeds at an extremely slow rate, some million times slower than the alpha particle emission rate of uranium.

d) *Spallation.* When nuclei are bombarded with projectiles in the 100 Mev. range, the nuclear transmutations most likely to occur are fission or spallation. Spallation (from "to spall" meaning to break by chipping) differs from fission in that instead of the target nucleus being split into two reasonably heavy fragments, only one heavy nucleus remains after a score of lighter fragments escape (nucleons, deuterons, tritons, alpha particles or other light nuclei). It differs from simple exchange reactions in that the original nucleus is greatly reduced in mass. Spallation seems to involve two distinct stages[36]. In the first or cascade stage, the incident particle seems literally to blow a hole into the nucleus driving out a shower of nucleons and pions and leaving the remaining nucleons in a state of excitement. The excess energy of the latter causes them to boil off (evaporation stage) as it were, leaving the residual nucleus in a state of lowest energy. The first process is more rapid (about 10^{-22} seconds), the latter is slower (about 10^{-16} seconds).

Similar to spallation is the *nuclear explosion* in which the incident particle (e. g. a primary cosmic ray) may impart such energy to the nucleus that it literally explodes into smaller fragments such as nucleons, deuterons, alpha particles and the like.

e) *Fusion.* In contrast to the above processess which are generally of a disintegration type, the process whereby heavier elements are built of nucleons or lighter elements is sometimes referred to as fusion. The simplest form of fusion would be the formation of helium from hydrogen, a process which presumably accounts for the energy of the stars[37]. Where sufficiently high temperatures are present this process can be made to take place directly. The same end result can be achieved with the aid

[35] P. R. Fields et alii, "Spontaneous Fission Properties of Elements 97, 98, 99 and 100" in *Nature*, vol. 174 (1954), 265—266; A. Turkevich, "Radioactivity and Nuclear Theory" in *A. R. of Phys. Chem.*, vol. 4 (1953), 125—127.

[36] P. E. Hodgson, "High-energy Nuclear Disintegrations" in *Science News*, n. 33 (1954) 40.

[37] For an excellent survey of literature on this subject see D. ter Haar, "Cosmogonical Problems and Stellar Energy" in *Reviews of Modern Physics*, vl. 22 (1950), 119—152.

of a nuclear catalyst such as carbon 12[38]. The so-called hydrogen bomb employs some type of fusion process. In its first form, it was triggered by some form of fission bomb which produced sufficient thermal energy for the fusion of hydrogen to helium. In the most recent type, the "fission-fusion-fission" bomb, the fission of uranium 235 by slow neutrons triggers the fusion process which produces such high energy nucleons that uranium 238 undergoes fission.

As we mentioned earlier, physicists generally favor the view that the elements in their present abundance have been built up gradually from protons and neutrons by some form of fusion process[39].

3. Nuclear Force

The physicist pictures the nucleus as a system of nucleons bound together by forces a million times more powerful than any other known force. To him this force is still a mystery in the sense that he has not been able to discover its laws or formulate the equations which describe its behavior. And this is his primary problem today. As the result of patient investigation, however, a number of the characteristics of nuclear force have come to light. It is a third and new kind of force distinct from either of the other two basic types (the gravitational and the electromagnetic forces). Whereas the action of the latter extends theoretically to infinity, the nuclear force is extremely short-range being practically inoperative at distances greater than 10^{-13} centimeters. Within this range, however, it overcomes any repulsive force due to the similarity of electric charge. It seems to operate equally well between proton and neutron, neutron and neutron, and proton and proton[40]. Theoretical considerations as well as experimental evidence indicate that at very close distances (of the order of 0.5×10^{-13} cm), it becomes repulsive so that the nucleons are prevented from falling into one another. In addition, nuclear forces show a saturation effect in as much as nucleons manifest a tendency to pair off and even to form closed systems or shells in much the same way as electrons in the atomic orbitals.

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[38] The probable reactions involved in fusion of helium from hydrogen by the so-called carbon cycle presumably operative in the main-sequence stars was first worked out by C. F. von Weizsäcker (*Physik. Zeitschr.*, vol. 38 [1937], 176; *ibid.*, vol. 39, [1938], 633) and H. A. Bethe (*Phys. Rev.*, vol. 55 [1939], 434).

[39] See note 6.

[40] Expressed more precisely, this *theorem of charge independence* states that the nuclear force between any two nucleons is the same provided their spin and angular momentum are the same and that correction is made for the slight Coulomb repulsion where two protons are concerned.

The precise structure of the nucleus, however, is far from clear and poses the second big problem of nuclear physics. But for all that, the nuclear physicist is not wholly in the dark. Experimental evidence indicates that the density of nuclear matter is roughly the same for all nuclei. Furthermore, nuclei are characterized by various quantum states of different energy. Though normally in the ground state (that of lowest energy), the nucleus may be excited or put in higher energy states either in the process of its formation, or by subjecting it to the influence of high energy radiation. After excitation, the nucleus tends to return to the ground state with the emission of one or more photons (gamma radiation). When the nuclear system is subjected to more radical disturbance, e. g. the capture of some elementary particle, the resulting aggregate or system may become so excited that it is no longer stable. Some combinations of nucleons too are unstable even in their ground state. This instability may be of two kinds. One is known as *dynamical* instability which leads to the eventual breakup of the system by the emission of some nucleon or group of nucleons as in the case of alpha emission, fission, spallation, and so on. The other is *beta* instability which leads to the conversion of a proton to a neutron or the reverse through the capture or emission of an electron or beta-particle.

When it comes to filling in the specific details of this general picture, however, the nuclear physicist's headaches begin. The situation of the atomic nucleus is far more complicated than that of the electronic shell structure of atoms. Yet the mathematical equations in the latter case are often so complicated for atoms of higher atomic number that they permit only partial solutions or rough approximations. In the case of nuclear structure, not only is the physicist plagued with complications of manybody wave-equations, but as has well been said, so long as he is ignorant of the basic law of nuclear force, he does not even know what equation it is he cannot solve. This then is his main concern.

The first significant steps towards a theory of nuclear force began with the discovery of the neutron in 1932. On the assumption that nuclei were composed of protons and neutrons[41], W. Heisenberg[42] and the Italian physicist E. Majorana[43], suggested that the attraction between proton and neutron might be of the nature of an exchange

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[41] The idea of a neutron-proton model was advanced independently by D. Iwanenko (*Nature*, vol. 129, 1932, 798) and W. Heisenberg (*Zeitschr. f. Physik*, vol. 77 [1932], 1).

[42] *ibid.*; see also W. Heisenberg, *Nuclear Physics*, New York, Philosophical Library, 1953, pp. 96—103.

[43] *Zeitschr. f. Physik*, vol. 82 [1933], 137.

force[44], a wave mechanical conception which had been used with such signal success in explaining the optical spectrum of helium. The obvious difference between proton and neutron is that one is electrically charged, the other not. Assume that at close range, this charge is transferred from one to the other so that proton becomes a neutron and the neutron a proton. Then we have the conditions necessary for resonance or exchange energy for the initial and end state of the transfer are of equal energy. Consequently, the two nucleons should be bound together. At first Heisenberg and Majorana assumed that the exchange involved positive and negative electrons, but the mass of the latter yielded values too large to explain the extremely short range of the nuclear force[45]. This discrepancy led to the development of the meson theory in which the notion of exchange forces are incorporated as part of a more general theory[46].

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[44] Exchange forces are a direct consequence of wave mechanics and have no exact equivalent in Newtonian or classical mechanics. If any system can be represented by two or more states with the same energy (resonance states), the probability of finding the system in either of the two states should be equal. The wave mechanical analysis is essentially a statistical treatment which is interpreted as giving the probability of finding the system in any given state. Hence, it treats the actual state as a combination of the two possible states. Now it turns out that energy of this combined state is actually lower than either of the two taken individually. This difference is called a resonance or exchange energy and is equivalent to an attractive force. It is used to explain binding of atoms in molecules, for instance, the hydrogen ion molecule. The latter consists of one electron and two protons A and B. The system may be represented as existing in one of two equal energy states, viz. one when the electron is bound to A, the other when it is bound to B. Since the wave function, according to one interpretation, implies the probability of finding the electron at any given distance from the two protons, in such an exchange coupling the electron is frequently described as oscillating rapidly between the two nuclei. It is questionable, however, how much reality can be attributed to this interpretation of the oscillating charge so long as the precise physical significance of the wave mechanical interpretation is not certain.

[45] The mass of the particle involved in the exchange interaction is inversely proportional to the range of that interaction. We might use the analogy of a ball being batted back and forth between two players. The lighter the ball, the further it can be batted; the heavier it is, the closer the two players must be to each other. The minimum effective range of a given particle is known as its Compton wave length and is equal to $h/2\pi$ mc, where h is Planck's constant, m the mass of the particle and c the velocity of light. For an electron the minimum effective range is too large, being of the order of 10^{-11} instead of 10^{-13} cm.

[46] In addition to the original charged meson theory, a *symmetric theory*, introduced by N. Kemmer (*Proc. Cambridge Phil. Soc.*, vol. 34 [1938], 354), employs the notion of neutral as well as charged mesons. Strictly speaking the notion of exchange forces applies only to the charged meson theory presumably responsible for proton-neutron interactions. Neutral mesons are required to explain the proton-proton as well as the neutron-neutron interaction. In contrast to the Majorana exchange forces (so-called because Majorana suggested the quantum mechanical operators which are most suited to treat them), those involving neutral mesons are called "ordinary" or Wigner forces (See for instance, Blatt and Weisskopf, *Theoretical Nuclear Physics*, New York,

Confirmation of the actual existence of exchange forces came in 1947, when 100 Mev. neutrons were hurled through a hydrogen filled cloud chamber. Photographs revealed encounters that could reasonably be explained only by assuming that when neutrons came within effective nuclear range of protons, the charge was exchanged so that the neutrons became protons and the latter, in turn, neutrons.

The meson theory originated in 1934 when Yukawa approached the problem of short range forces from a different angle. If the electron mass was too small to account for the effective nuclear range, just how heavy would an electron have to be to qualify? Yukawa computed the mass of such a meson or heavy electron and worked out a theory of nuclear fields of which the meson was the quantum of nuclear energy. He also predicted that the meson should break up into an electron and a neutrino after a mean lifetime of 10^{-6} seconds.

Perhaps his theory would not have attracted the attention it did had not a meson which followed the predicted decay plan been discovered by Anderson and Neddermeyer just two years later. But the finding of the muon also had the disadvantage of leading the physicists up a blind alley for almost a decade as they vainly elaborated a plethora of meson theories based on different assignments of spin and parity[47] for the meson and different types of coupling to the nucleon (direct vs. gradient coupling, single vs. meson pair coupling, etc.). When the pi

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J. Wiley and Sons, 1952, p. 137). In all cases, however, a charged or neutral meson is presumed to be emitted by one nucleon and absorbed by the other. Such mesons are referred to as *virtual*, and are distinguished from the mesons existing apart from the nucleus which are called real. The precise physical meaning of these "virtual" mesons is a problem about which philosophers may speculate. From the physicist's viewpoint, however, they are identified with the meson field surrounding the nucleons. As we know from the unified quantum theory, the same phenomenon may be described either in wave or particle language, or more precisely, in terms of wave mechanics or of matrix mechanics. Two electrically charged particles may be said to influence one another (a) either because of the electromagnetic field which surrounds them (wave description) or (b) because one emits a virtual photon which the other absorbs and vice versa (particle language). In the same way, the physicist speaks of the nucleons being surrounded by a meson field or field of nuclear force (wave description), or that one nucleon emits a meson which the other absorbs and vice versa (particle description). It may be of interest to note that the photon in the case of the electromagnetic field or the meson in the case of the nuclear field is called virtual because the emission of a real meson or photon would entail a violation of the law of conservation of energy and momentum. Nevertheless the Heisenberg uncertainty principle permits such a violation by an amount of energy δE, provided it is paid back in time δt, where

$$\delta E \times \delta t = h/2\pi$$

Of course the physicist is precluded from ever investigating this area (Bohr's Complementarity Principle) so that he will never know to what extent his "virtual" meson was ever "real".

[47] See note 3.

meson was finally discovered and its properties studied, nuclear physicists were convinced that the pion field must be chiefly responsible for the interaction of nucleons. While the behavior of the pion gives a strong support to the qualitative features of Yukawa's theory, nuclear physicists have still not succeeded in working out a quantitatively correct meson theory of nuclear force[48].

Various models of nuclear structure have been suggested such as the liquid drop model, the alpha particle model, the independent particle model, and so on[49]. Already in 1936 Bohr pointed out that where strong interaction between nucleons prevails such as that produced by Yukawa or Heisenberg exchange forces, the nuclear structure could be fairly accurately depicted by the analogy of a liquid drop in which the nucleons are more or less firmly bound to one another. One of the principal merits of the model was that it could account rather well for the fission of nuclei, but it failed to explain the excited states of nuclei or the unusual stability of magic number nuclei.

More recently attention has turned to an improved version of the shell model developed independently by Maria Goeppert Mayer[50] and O. Haxel, J. H. D. Jensen, and H. E. Suess[51]. Unlike the liquid drop model which postulates a strong interaction between the nucleons, this independent particle model is based on the assumption that the nucleons behave with considerable independence of one another much like the

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[48] The main difficulty has been the lack of adequate mathematical techniques for dealing with complex theoretical equations of the various versions of the theory. Since 1947, the great advancement in the mathematical treatment of fields by the technique of "renormalization" (whereby quantities which used to turn out infinite are re-interpreted as a change of the mass and the charge of the particle) permits the reassessment of the relative merits of meson theories by permitting finite and experimentally verifiable answers to well-defined problems. The works of Brueckner, Lévy, Drell, Henley, Chew, Dryson and others have led the way to new and promising developments of the meson theory (Cf. Bethe and de Hoffmann, *Mesons and Fields*, vol. 2 pp. 192—199). M. Lévy's recognition of the repulsive nature of the nuclear force at very small distances (Cf. M. M. Lévy, *Phys. Rev.*, vol. 86 [1952], 806; *ibid.*, vol. 88 (1952), 72 and 725) makes it possible to account for the stability of the heavier nuclei without the introduction of the heavy meson or hyperon. For it predicts inbetween three or more nucleons which "hand a meson to each other around the circle", as Bethe expresses it ("Mesons and Nuclear Forces", *Physics Today*, vol. 7, n. 2, Feb. 1954, 11). As Weisskopf points out *(op. cit.)* these many-body forces may be quite important in accounting for the saturation of nuclear forces which prevents the collapse of heavy nuclei. But for all that nuclear physicists are still not sure that the pion can provide the basis for a correct meson theory of nuclear force (Cf. Lévy and Marshak, "Brief Report on the Present Status of Meson Theory of Nuclear Forces" in *Proc. of Glasgow Conference*, pp. 10—23).

[49] Cf. Blatt and Weisskopf, *Theoretical Nuclear Physics*, pp. 266 ff.

[50] *Phys. Rev.*, vol. 75 (1949) 1969; *ibid.*, vol. 78 (1950) 16.

[51] *Phys. Rev.*, vol. 75 (1949), 1766; *Z. Physik*, vol. 128 (1950), 295.

electrons in the extranuclear structure of the atom. Some of the quantum factors that apply to the latter can be attributed to the nucleons such as the principal quantum number, angular momentum and the spin number. In addition a new quantum factor is introduced, the spin-orbit coupling[52] and in more recent extensions of the model, other quantum numbers are employed[53]. Using the Pauli exclusion principle, one can consider the nucleus to be formed by gradually filling up of different energy levels with neutrons and protons in much the same way as electrons were presumed to fill the electron shells in the old Bohr theory of the atom. In the latter model, the inert gases because of their closed electron shells represent particularly compact and stable electron structures and the atomic numbers 2, 10, 18, 36, etc. might be called the "magic numbers" of the periodic table. In similar fashion 2, 8, 14, 30, 38, 50, 82, 126 and recently 152 appear as "magic numbers" of nucleon structure, in the sense that a nucleus having a magic number of protons, or especially a magic number of neutrons are pronouncedly more stable than their neighbors. One of the features of the shell theory is that the magic numbers appear as natural divisions between levels that differ greatly in energy. The shell theory in addition has been rather successful in explaining a number of nuclear properties such as isomers[54], nuclear spins and even in some cases the magnetic moments and quadrupole moments of nuclei in the ground and lower energy states.

This success of the shell model is rather surprising since it begins with an assumption seemingly at variance with the strong interaction between nucleons experimentally observed in pion-nucleon scattering. Recently Weisskopf has suggested a way out of the dilemma. He points that the strong interaction models are based on reactions of nuclei or nucleons involving high nuclear excitation energies. Thus, for instance, the exchange forces predicted by Heisenberg operate where high energy neutron beams are scattered by hydrogen nuclei or in nuclear fission that is neutron induced. On the other hand, the most successful prediction made on the basis of the shell model apply to nuclei in the lowest

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[52] This factor indicates whether the spin of the nuclear particle is aligned parallel or antiparallel to the direction of its orbital rotation. It is introduced to account for the higher magic numbers.

[53] Cf. e. g. E. Feenberg, *Shell Theory of the Nucleus*, Princeton, Princeton University Press, 1955, chap. 10; M.G. Mayer and J. H. D. Jensen, *Elementary Theory of Nuclear Shell Structure*, New York, J. Wiley and Sons, 1955.

[54] As used in nuclear physics, isomers designate nuclei with the same atomic number and mass but different radioactive properties. Nuclear isomerism is due to the fact that nuclei can exist in excited as well as the ground energy state.

energy levels (the ground state and first excited state). The reason the nucleons of normal nuclei act as independent particles and do not show the effects of any strong interaction can be attributed to the fact that the adjacent energy levels in normal nuclei are filled. The Pauli exclusion principle in such a case forbids a reaction between the nucleons in much the same way that it forbids a strong interaction between electrons in a metal. In both cases, the energy of particles behaving as a degenerate gas is not sufficient to put the particles with which they come into contact in one of the high energy levels that lie beyond those already filled. Hence they have much greater freedom of movement that would be expected in view of their close proximity in the nucleus. In the case of fission or neutron scattering by protons, however, if the energy of the incident particle is greater than the energy of the nucleons in the last energy level to be filled, scattering will take place and the formation of independent orbits will be prevented[55].

Promising as this qualitative argument is, actual attempts to provide quantitative verification of Weisskopf's view have not been too successful[56]. The relative success of the shell model still remains something of a mystery. In the last five years the theory of shell structure has been rapidly extended and deepened[57]. Attempts have been made to combine the shell theory with the best features of other models, particularly those which take into consideration the collective motion of nucleons[58]. While results have been promising, no one consistent model has been found so that we must use different nuclear models, as J. A. Wheeler puts it, "to look into the same room through different windows[59]."

Despite the intensive study brought to bear on the problem of nuclear forces "much remains to be done before it can be said that the nature of nuclear forces is fully understood[60]." And even when we reach such "understanding", as the physicist uses the word, shall we have solved all the questions about matter we can hope to solve. Max Planck, the

[55] V. Weisskopf, "Nuclear Models", *Science*, vol. 113 (1951), 101.

[56] Cf. e. g. Feenberg, *op. cit.*, p. 201.

[57] I. Perlman and J. M. Hollander, "Radioactivity and Nuclear Structure" in *A. R. Phys. Chem.*, vol. 5, (1954), 119 ff; *Proceedings of the 1954 Glasgow Conference on Nuclear and Meson Physics*, esp. part II on nuclear models; Feenberg, *op. cit.*; Mayer and Jensen, *Elementary Theory of Nuclear Shell Structure;* A. de Shalit and M. Goldhaber, *Phys. Rev.*, vol. 92 (1953) 1211, A. R. Edmunds and B. H. Flowers, *Proc. Roy. Soc.*, vol. 215 (1952), 120, etc.

[58] J. A. Wheeler, "Survey of Nuclear Models" in *Proc. of 1954 Glasgow Conference*, pp. 38—46; D. L. Hill and Wheeler, *Phys. Rev.*, vol. 89 (1953), 1102; A. Bohr and B. R. Mottelson, *ibid.*, vol. 90 (1953), 717, etc.

[59] Wheeler, *Survey of Nuclear Models*, p. 46.

[60] H. S. W. Massey, "Survey of Nuclear Forces" in *Proc. Glasgow Conf.*, p. 9.

"father of the Quantum theory", ironically enough was advised by von Jolly, Professor of Physics at the University of Munich, to take up music or classical philology since "there was nothing new in physics to be discovered[61]." Perhaps we are, as many contemporary physicists believe, approaching the last outposts of atomic knowledge possible to man. But be that as it may, an aura of mystery will always cling to the atom whose unbelievably rich structure belies its name. It continues to intrigue and perplex the human intellect, ever teasing it with the promise of a full confession, while luring man deeper into its labyrinthine core. Even the very lowest of God's creatures, as it were, mocks the proud mind of man, and mirrors in its own way something of the mystery of its Creator.

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[61] W. Meissner, "Max Planck, the Man and His Work" in *Science*, vol. 113 (1951), 75.

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(Continuatio)

f. 223va Postea quaeritur quando, id est in qua aetate, possunt contrahi sponsalia?

Quod autem in septimo anno et non ante dicunt plura iura, Extra. De Spon. impuberum, Accessit, et Ex litteris[1].

Secundo, si postquam ad septem annos pervenerint, possunt reclamare, et irritare quidquid ante factum est, Extra. De spon. impuberum, Decessit[2], at argumentum a simili De voto religionis, Dist. XXVIII, De his; XX, qu. 1, Illud[3].

Tertio, quare matrimonium initiatum est semiperfectum, quia ad existentiam rei in actu concurrunt materia sufficienter disposita et forma. Ergo, per sponsalia sufficienter disponatur huiusmodi materia, et non exigitur postea nisi consensus de praesenti. Videtur quod quasi dimidium facti illius sit initium. Unde illud dimidium facti qui bene coepit habet. Ergo, si perfici non potest secundum iura donec vir habet quattuordecim annos, videtur quod medietas huius temporis recte respondet initio matrimonii. Ergo, septennium tam in viro quam in muliere.

Contra. Videtur quod minus de tempore sufficiat, quia legimus in Beato Gregorio[4] de puero illo quinque annorum quod blasphemabat, ergo iam discretionem aliquam habebat; ergo cum discertio sufficiat ad consensum, videtur quod ante septem annos possint consentire ad sponsalia.

Item, Extra. De spon. impuberum[5], De illis, malitia supplet aetatem.

Respondeo. Tempus septem annorum ad sponsalia contrahenda determinatum est per iura, et ad hoc potest esse duplex ratio, quia cum

[1] c. 5, Accessit, X, De desponsatione impuberum, IV, 2 (II, 673).
[2] Read "Accessit" instead of "Decessit", and cf. preceding note.
[3] Cf. *Decret. Grat.* c. 5 De iis, Dist. XXVIII, and ibid. c. 10, C. XX (ed. Friedberg, I, 101, 845).
[4] *IV Dial.*, c. 18 (PL 77, 349).
[5] c. 9, De illis, X, De desponsatione impuberum, IV, 2 (II, 676).

ad talem contractum exigatur usus rationis, non debuit ad hoc tempus determinari nisi illud in quo ratio suum usum habere potest quantum ad consensum. Hoc autem est septennium, quod ex duplici via potest perpendi. Primo, per experimentum sensus quia tunc praeviden tur pueri, ut in pluribus, astuti et doli capaces, et si in aliquibus praeoccupetur illud tempus, in aliquibus autem plus exigatur temporis. Communiter tamen in annis septem solent rationales esse quantum ad talia, et ideo cum iura in talibus contingentibus non possunt respicere singula, quia impossibile est omnia talia contingentia similiter se habere, ideo respiciunt quod in pluribus, et propter hoc septennii tempus ad hoc determinatum est secundum illud quod dicitur Extra. De spon. impuberum, Litteras[6], quod ex illo tempore sponsalia placere consueverant.

Quod ergo obicitur in contrarium de puero quinque annorum blasphemante, dicatur quod consuetudines et iura non respiciunt quod in aliquo accidit, sed quod in pluribus. Unde dicitur etiam quod privilegia paucorum non faciunt legem communem.

Per hoc respondetur ad decretalem, quia verum est quod in aliquibus praevenit aetas ratione malitiae, cum consensus non respicit quod singulariter evenit, sed quod commune.

Quod obicitur post quod medietas temporis quod exigitur ad matrimonium sufficit ex parte viri, ergo similiter ex parte mulieris, dicatur quod aliud est ex sponsalibus et aliud de matrimonio, quia sponsalia solum actus requirunt ex parte rationis, scilicet discretionem aliquam qua possit consentire, et quia hoc in utroque sexu convenienter non est ante septimum annum, unde illud tempus secundum tempus viri qui iunior est metitur. Quia ergo in viro non est communiter ante septimum annum, ideo nec in muliere ponitur in pauciori tempore. Et ideo communiter tempus septennii ad sponsalia determinatur. Matrimonium autem non solum perfectionem requirit vel actum ex parte rationis, scilicet, consensum de praesenti, sed etiam potentiam vel perfectionem ex parte naturae vel corporis, secundum quod potentia generativa possit exire in actum quantum est ex parte corporis, et quia ante decimum quartum annum non potest in viro, anno autem duodecimo potest in muliere, et hoc communiter loquendo, quamvis in aliquibus specialiter praeveniatur huiusmodi tempus, ideo patet quod recte medietas temporis quod sufficit ad matrimonium secundum iura ex parte viri determinatur ad sponsalia; ex parte vero mulieris, non.

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[6] c. 4, Litteras, X, De despon. impub., IV, 2 (II, 673).

Quod obicitur quod actus naturae praecedat actum rationis, dicatur quod iste homo et est individuum quoddam in se; et est principium alterius hominis natura; ergo, quoddam habet actus in isto individuo considerato secundum se, ut nutrire, augmentari, et huiusmodi, quae pertinent ad conservationem et subsistentiam huius individui, et de his et talibus bene precedit ratio. Habet etiam natura in isto individuo actus vel actum secundum quod est principium alterius eiusmodi generis, et talis non antecedit sed sequitur actum rationis, quia prius potest uti ratione quam organa vel corpus his motibus sufficientia sint ad actum talem, et ideo de talibus non valet ratio; talis autem actus naturae requiritur ad matrimonium. Et ideo cum iste actus requirat tempus quattuordecim annorum communiter in viro, vel duodecim in muliere, ut praedictum est, et ante hoc, scilicet septem, potest ratio exercere actum sufficientem ad sponsalia, patet quod propter illam rationem non exigitur plus tempus ad sponsalia contrahenda quam determinatur in iure.

Postea est quaestio utrum sponsalia solvi possunt?

Quod non, argumentum XXVII, Q. II, Si quis[7], et iterum sequens capitulum Si quis; ibi dicit capitulum quod si quae disponsata est alicui et praeventus est morte quod nullus de parentula illius eam habebit. Ergo, cum tantum teneretur isti quantum prohibetur ab aliis, si aliis non potest coniungi de iure, nec ab isto poterat separari.

Contra, Extra, De spon., Praeterea[8] hi qui de matrimonio contrahendo, ibi videtur dici quod si spondentes nolunt implere quod spopondent, possunt sibi invicem remittere promissionem. Secundo, quia quod non est, non ligat. Sed ea promissio cum sit de futuro non est, ergo non ligat isti. Ergo, potest rescindere cum vult. Tertio, quia quod est contingens non est natura indissolubile. Sed veritas futuri est contingens, ergo, etc., quia in singularibus et futuris non est determinata veritas.

Respondeo. Sponsalia indissolubilia sunt quia sine peccato non possunt solvi, quia qui promittit se accepturum, aut non intendit quod dicit facere, et sic non sunt sponsalia, quia mentitur iste; aut intendit dicere verum, et sic sunt sponsalia, et tunc ligat se ultra, subdit legi
f. 223vb veritatis et rectitudini veritatis; et quia veritas immutabilis | est, non potest ire contra talem rectitudinem quin deviet a rectitudine. Ergo, si a rectitudine aliqua deviare debet, planum est quod de iure contra promissionem venire non potest. Unde non contradicit verbo veritatis

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[7] *Decret. Grat.* c. 11, C. XXVII, qu. 2 (I, 1065), and *ibid.* c. 14, Si quis (I, 1066).

[8] c. 2, Praeterea, hi qui de matrimonio, X, IV, 1 (II, 661).

ullo modo. Et secundo eiusdem quarti est de hac materia[8a] quod potest ad hoc valere. Tota ergo causa quare indissolubilia sunt sponsalia est veritatis immutabilitas cui iste adhaeret et se ligat. Sciendum tamen quod et sponsalia possunt considerari secundum se, et sic indissolubilia sunt, vel per comparationem ad tertium ut ad aliquam formaliter formam vel promissionem, et sic solvi possunt sponsalia, ut si de praesenti consentiat in aliam, solvitur sponsio de futuro cum prima, et tenet ista. Et hoc quia veritas utrobique ligabat. Sed fortius ligat cum ista quam cum illa, et ideo ruptum est aliud vinculum. Tamen iste sine peccato non rumpit, quia indissolubile erat per naturam suam. Sed molestiam ei fecit, et ideo peccavit.

Quod ergo primo adducitur Extra. De sponsalibus, solvitur in apparatu, quia apparatus concordat opinioni Hugguccionis[9], qui dicebat et bene quod decretalis illa loquitur permissive et dispensative, et hoc probat per verba decretalis quae dicunt hoc possit in patientia tolerari, ne deterius inde contingat. Alioquin debebant de iure compelli ut fidem servarent.

Habito de causa matrimonii initiati, circa secundum partem quaeritur de causa matrimonii rati, scilicet de consensu, et quaeruntur quattuor; primo utrum consensus sit causa efficiens matrimonii rati; secundo, utrum solus consensus; tertio, in qua aetate possit fieri; quarto, utrum possint dissolvi?

Ad primum, in nullo alio sacramento est suscipiens causa efficiens, ergo nec hic. Sed, si coniuges non sunt causa efficiens matrimonii, nec eorum consensus vel voluntas, quia cuiuscumque est causa voluntas mea, ego sum causa illius. Ergo, si non sum causa, ergo nec voluntas mea est causa.

Secundo, quia consentire non est efficere rem in actu, sed est respectu rei factae vel fiendae. Ergo, consensus est causa efficiens. Ergo, etc.

Contra. Primo, per multas auctoritates in Littera[10], et sic sustinetur, Dist. XXVII, Q. II, cap. 1[11].

Secundo, quia in aliis sacramentis verbum est causa efficiens, non tamen quia verbum, sed ratione contenti in verbo. Similiter ergo in ipso verbum est causa efficiens, sed non ratione verbi sed ratione eius quod continet. Sed nihil aliud continet verbum in hoc sacramento nisi consensum. Ergo, consensus est causa efficiens matrimonii.

[8a] *Cf. Extra. ed.* Friedberg, II, 672 sq.
[9] Cf. *Decretales D. Gregorii Papae IX*, Venetiis (1584), col. 1420.
[10] Cf. Lombard, *IV Sent.*, Dist. 27 (*ed.* Quaracchi II, pp. 917 and 922).
[11] *Decret. Grat.* c. 1, C. XXVII, qu. 2 (I, 1063).

Respondeo. Consensus est causa efficiens coniugii quia est causa coniunctionis animorum, et facit eam ad quam sequitur aliae coniunctiones, scilicet corporum, conformitatis et morum et conversationis. Primo enim unus coniugum ut vir exprimit suum sensum, quod scilicet sentit in corde et quod corde vult exprimit, dico ore, et postmodum mulier percipit aure et concipit illum corde, et suum sensum sive suam voluntatem voluntati viri unit, idem volendo, et post suum sensum sive quod ulterior exprimit ore, vir percipit aure, et concipit corde, et sic uniuntur invicem sensus amborum et voluntates, et fit consensus quasi sensus unicus, vel similis sensus, et in hoc animi coniunguntur ad quam coniunctionem caeterae sequuntur.

Ad primum ergo quod suscipiens non est efficiens etc., dicatur quod matrimonium potest considerari ut coniugium, et sic consensus est efficiens ibi simpliciter, vel ut est sacramentum, et sic Deus per gratiam est causa efficiens, consensus vero est cooperans extra, non efficiens principaliter, et sic procedit ratio, non primo modo.

Ad aliud quod consentire non est efficere triplex est sensus sicut et distinguitur voluntas antecedens, consequens, et concomitans. Consensus antecedens est respectu faciendi, vel non faciendi, et hoc non est causa efficiens rem respectu cuius est et antecedit, ut est consensus in sponsalibus. Consensus autem concomitans est uniens animos, ut visum est, et sic est causa efficiens quia facit hanc transire in dominium viri et istum in dominium mulieris quantum ad actum coniugalem. Consensus autem consequens est de continuando primum consensum iam factum de antecedente. Ergo, et (*read* de) consequente, non de concomitante, procedit ratio.

Ad secundum obicitur "quos Deus coniunxit homo non separet[12]," ergo Deus est efficiens, non ergo solus consensus coniugum.

Item, XXX, Q. V, Aliter et XXXII, Q. II[13]; cum ergo utrobique habetur quod consensus parentum requiritur et non sit matrimonium sine illo, ergo, etc.

Secundo, quia quamdiu filii non sint emancipati habent parentes potestatem super eos, et auctoritatem in factis eorum; unde Apostolus, "Filii, obedite parentibus[14]." Ergo, quod faciunt auctoritate parentum debent facere. Ergo, et eorum consensus ibi requiritur, et habet hoc auctoritas. Ergo, est efficiens.

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[12] Matt. 19, 6.

[13] Cf. c. 1, Aliter, C. XXX, qu. 5, 4 (I, 1104), and c. 13 ff., Honorantur parentes, C. XXXII, qu. 2 (I, 1124).

[14] Col. 3, 20.

Contra. "Propter hoc relinquet homo patrem et matrem et adhaerebit uxori suae[15]." Ergo, conceditur eis contrahere ex auctoritate divina, relictis patre et matre. Ergo, non requiritur eorum consensus.

Secundo, quia in spirituali coniugio ut animae cum Deo semper licet ad arctiores amplexus ascendere, et arctiori vinculo se constringere. Unde semper licet ad arctiorem religionem transire. Ergo, semper ex parte vinculi carnalis quod est signum illius spiritualis, semper licebit arctius se stringere et ad arctius vinculum transire. Sed arctius est vinculum inter virum et uxorem quam inter parentes et filios, ut habitum est supra. Ergo, semper licet filiis, velint vel nolint parentes, transire ad vinculum coniugale. Ergo, solus consensus eorum, non parentum, est causa efficiens coniugii.

Respondeo. Possumus loqui de matrimonio vel in quantum sacramentum, et sic Deus per gratiam est causa efficiens, et consensus coniugum cooperans, ut dictum est supra. Vel, in quantum coniugium, et sic est loqui de causa matrimonii efficiente dupliciter, quia *li* solus, cum quaeritur utrum solus consensus sit efficiens, potest esse cathema
241ra vel sincathema, | et potest facere generalem exclusionem vel specialem. Si sincathema et generalem facit exclusionem, sic est falsum quod solus consensus sufficiat, quia Deus est ibi causa efficiens, et ultra hoc quod est generalis causa efficiens in omnibus actibus nostris, quia, "Sine me", sicut ipse dicit, "nihil potestis facere[16]." Est ipse haec causa efficiens specialis, scilicet legem coniugii instituendo, et coniugii contrahendi auctoritatem praebendo, secundum quod dicitur in Gen. "Propter hoc relinquet homo patrem et matrem et adhaerebit uxori suae, et erunt duo in carne una[17]." Si *li* solus sit cathema tunc specialem facit exclusionem, ut sit sensus, solus consensus coniugum, id est non alius consensus, tunc possumus loqui de hoc dupliciter, scilicet quantum ad necessitatem, et sic non requiritur alius consensus nisi consensus coniugum, et rationes huius tactae sunt in opponendo, scilicet tum quia auctoritas eis conceditur divina non habito respectu ad patrem et matrem, immo resistente, patre et matre, quia hoc vinculum quod est inter virum et mulierem et maius et fortius et nobilius vinculum amoris et unitatis quam sit vinculum quod est inter prolem et parentes, et ideo licet semper ad hoc fortius vinculum auctoritate Domini transire. Vel possumus loqui de hoc consensu sive de causa efficiente quantum ad honestatem et sic requiritur consensus parentum et traditio eorum, et solemnitas etiam

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[15] Gen. 2, 24.
[16] Jn. 15, 5.
[17] Gen. 2, 24.

Ecclesiae requiritur, tum propter honestatem tum propter probationem, si oportuerit.

Quod ergo primo obicitur per auctoritatem Evangelii et per illa decreta iam solutum est.

Ad aliud dicatur quod verum est; quamdiu enim filii non sunt emancipati, habent parentes potestatem super eos et auctoritatem in factis eorum. Sed quidam actus sunt qui eos extrahunt de potestate parentum et eos emancipant, scilicet, ubi transitur ad altius vinculum ut ad claustrum, et similiter ad coniugium, quia etsi filius sit de carne parentum, et quantum ad hoc fit cum eis una caro, non tamen ita spiritualiter est una caro cum eis, sicut cum uxore, quia una caro omnino reputantur vir et uxor, et una voluntas, et quasi unum principium vel una persona respectu prolis procreandae, in qua spiritualiter uniuntur et propter gratiam unionis sibi ad hoc specialiter collata, secundum quod habitum est supra[18].

Quantum ad tertium quaeritur, primo, utrum ex parte mulieris requiritur duodecimus annus, ex parte viri decimus quartus; secundo, quare maior aetas requiritur ex parte viri quam ex parte mulieris.

Ad primum Extra. De spon. impuberum, Puberes[19], habetur quod minor aetas sufficit, quia ibi habetur quod pubes est qui generare potest, et hoc potest esse ante aetatem praedictam secundum quod ibidem dicitur, "Puerperae sunt quae in annis puerilibus pariunt[20]." Ergo, etc.

Praeterea, de coniugio Mariae et Ioseph habetur XXVI, Dist., cap. Cum igitur, "Tanto sanctius fuit atque perfectius quanto a carnale opere immunius[21]." Et XXX, cap. Inter quos, "Sanctiora sunt coniugia pari voto continentium[22]." Ex his patet quod non requiritur aetas in qua possit opus carnale exerceri, sed solum in qua possit invicem consensus haberi. Ergo, si antecedit haec aetas aetatem praetactam, videtur quod ista aetas non requiritur.

Contra. Extra, De spon. impuberum, Attestationes, Ex litteris[23], ibi habetur quod quartus decimus requiritur ex parte viri, ergo a simili duodecimus ex parte feminae, cum haec sit aetas secundum iura taxata ex parte feminae, sicut illa ex parte viri. Ratione huius quaeritur utrum maior aetas requiritur in viro quam in muliere, et videtur quod maior

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[18] Cf. ed. supra p. 295.
[19] c. 3, Puberes, X, De despons. impub. IV, 2 (II, 673).
[20] Cf. *ibid.*
[21] Cf. Lombard, *IV Sent.*, Dist. 26 (ed. Quaracchi II, p. 914).
[22] Cf. Lombard, *IV Sent.* Dist. 30 (ed. cit. II, 932).
[23] c. 10, Attestationes, X, De despon. impub. IV, 2 (II, 676), and c. 11, Ex litteris, X, De despon. impub. IV, 2 (ibid.).

aetas requiratur ex parte mulieris quia XX, Q. I, Sanctimoniales[24] habetur quod mulier non debet consecrari usque ad quadragesimum annum. Sed constat quod viri plus multum ante possint consecrari in subdiaconos, diaconos, et sacerdotes, secundum quod tactum est in iure[25]. Ergo, quantum ad matrimonium spirituale minor aetas requiritur in viro et maior in femina. Ergo, a simili etc.

Secundo, quia ad matrimonium carnale contrahendum exiguntur duo, scilicet discretio et potentia generandi, sive quod generativa possit egredi in actum suum. Sed in his duobus antecedit vir mulierem secundum tempus.

Contra. Primo, quia in via generationis imperfectum praecedit perfectum. Unde secundum Philosophum[26] in via generationis prius est animal quam homo. Ergo, in via generationis sive inter principia generationis prius est tempore quod minus est perfectum quam quod magis. Sed mulier in generatione est principium minus perfectum quia materiale et passivum, vir autem est principium magis perfectum; unde citius venit mulier ad statum suum ut possit esse principium generationis quam vir.

Respondeo. Ad primum horum duorum dico quod forma verborum quibus exprimitur consensus requirit quod tales sint qui contrahunt quod habeant potentiam generandi paratam, non quod habere possint, sed quod actualiter habeant. Cum enim dicitur, "Accipio te in meum," et "Ego in meam," unus transit in dominium alterius. Non tamen intelligendum est hoc quantum ad sua, quia unus non fit suus alterius, et econtra, sed intelligitur hoc quantum ad corporalem usum quod requirit matrimonium et propter quod instituitur, scilicet propter creationem prolis. Unde sicut de praesenti dicitur, "Accipio," sic de praesenti exigitur propter formam verborum quibus exprimitur eorum consensus, non falso sed vere, quod actualiter habeant aptitudinem ad generandum. Hoc potest habere ex Causa XXXII, Q. II, Pudor est[27], et Extra, De spon. impuberum, Puberes[28], ibi certum est; et quia huius potentia generandi potens est egredi in actum in muliere anno duodecimo, in viro decimo quarto, ideo requiritur talis actus vel virtus talis aetatis; taiis autem aetas complete attenditur et regulariter in viro. Quod autem in muliere minor aetas sufficit quam quattuordecim, hoc est propter imperfectionem illius. Quare autem in viro sit talis virtus

[24] c. 13, C. XX, qu. 1 (I, 846).
[25] *Decret. Grat.* c. 1—2, Dist. LXXVIII (I, 275).
[26] *Aristoteles, De animalium gener.* c. III (Didot 3, 351).
[27] c. 1, Pudor est, C. XXXII, qu. 2 (I, 1119).
[28] c. 3, Puberes, X, De despon. impub. IV, 2 (II, 673).

in decimo quarto, recurretur ad rationem superius assignatam de septennario sponsalium, quia principales mutationes quae fiunt in homine | *f. 224rb* fiunt un numero septennario ad exemplum primae mutationis quae est exemplar aliarum. Quia ergo vegetativa in septennario operatur in utero, sensibilis postea in septennario annorum, ita et tunc ratio incipiens operari minus completa est usque ad quattuordecim, quia nondum completus est suus septennarius. Tunc autem suo septennario completo, est ipsa ratio completa et perfecta secundum naturam in isto, et tunc completa est et perfecta anima rationalis in illo quantum ad omnem sui potentiam secundum naturam; et quia perfecti est generare sibi simile, ideo tunc primo regulatum est hoc individuum, quod usque modo perfectum est in se secundum potentiarum animae naturales operationes, potens ad sibi simile producendum. Quod autem inferior aetas sit in muliere sufficiens, hoc autem est propter imperfectionem illius. Hoc est ergo ratio aetatis determinatae ad matrimonium. Alia ratio est conveniens ad istam, et a posteriori, scilicet exprimunt sensus, quia scilicet in tali aetate apertum est quod generare potest vir et mulier concipere, sed quia quod sensibiliter apparet causam habet in natura, ideo illam rationem praehabitam causam huius ponimus.

Quod ergo minor aetas videtur sufficere in quibusdam secundum illam decretalem Puberes[29], bene concedimus quod aliquando minor aetas sufficit, sed communiter attenditur illa aetas, et quia statuta iuris de his contingentibus non secundum singulares eventus sed secundum communem statum dantur, ideo nihilominus requiritur talis aetas ad contrahendum. Unde semper requiritur duodecim ex parte mulieris, vel virtus anni duodecimi, ex parte viri decimi quarti, cum malitia dicitur supplere aetatem. Et hoc tangitur in apparatu Puberes, "Pubertas ex vigore naturali, non ex annorum numero comprobatur[30]."

Ad aliud quod consensus secundum discretionem requiritur ad contrahendum matrimonium, non secundum quamcumque discretionem, sed secundum discretionem perfectam, non enim tunc debent habere discretionem ad se solos regendum, sed etiam ad regendum familiam, propter quam habendam contrahunt. Quamvis ergo discretio et consensus secundum discretionem possit esse in minori aetate, tamen talis perfecta discretio in aetate a iure determinata, scilicet duodecimo et decimo quarto anno, propter rationes praehabitas attenditur, vel in aetate habente illius aetatis, quando scilicet malitia in aliquibus praevenit aetatem. Generaliter tamen secundum quod dantur statuta iuris

[29] *Ibid.*
[30] *Ibid.*

non respectu huius vel illius, sed respectu communitatis debet attendi annus duodecimus hinc et quartus decimus inde.

Ad id quod postea quaeritur respondeo quod minor aetas requiritur in muliere quam in viro, quia humidum quod requiritur praecipue ad generationem magis est passibile in muliere quam in viro. Unde et citius consumptibile est a calido consumente, et idcirco mulieres per naturam citius moriuntur, et breviores vitae sunt quam viri.

Quod ergo obicitur de XX, Q. I, Sanctimoniales[31], intelligendum est secundum aliquorum consuetudines, et non praecise loquitur, quia alibi eadem quaestione, Placuit[31a], dicit quod ante vicesimum quintum annum nec virgo consecratur nec vir in diaconum consecratur. Ecce quod ponit quantum ad hoc virum et mulierem quasi in aequali, eadem quaestione Iuvenculas[32] dicit quod debet esse mulier consecranda sexagenaria, et sic patet quod non praecise sed secundum diversas consuetudines in diversos casus loquuntur de hoc iura. Et ideo non est hoc ad contrarium trahendum.

Quod obicitur quod in viro est magis de calore naturali quam in muliere, verum est; sed ad generationem non solum calor mediante quo fit digestio humidi naturaliter, sed ipsum humidum obediens calori et digestibile ab ipso requiritur. Quamvis ergo plus de calore sit in viro et minus in muliere, tamen propter imperfectionem mulieris respectu viri humidum in ipsa magis est obediens, quia magis passibile, et ita magis digestibile, et magis obediens est parvo calori qui in ea est quam humidum in viro sit obediens maiori calori, quia propter perfectionem viri fortius et perfectius est humidum in viro quam in muliere, et ideo minus passibile, et ita minus digestibile est a calore quamvis maiori, et ideo non valet ratio. Sed valeret si humidum in utroque similiter se haberet.

Circa quartum videtur quod matrimonium verum, vel per verba de praesenti contractum, possit solvi, quia verum matrimonium est inter fideles, XXVIII, Q. I, Non est ratum[33], et Extra. Qui matrimonium accusare possint, Quanto[34], et tamen dissolvi potest, sicut dicit idem capitulum, et Extra. De his qui matrimonium accusare possint, Quanto[35], et iterum XXVIII, Q. II, Si infideles[36], a quo capitulo sumitur illud quod dicitur in illa decretali, Quanto, quod contumelia etc.

[31] c. 13, Sanctimoniales, C. XX, qu. 1 (I, 846).
[31a] c. 14, Placuit, *ibid.*
[32] Cf. ibid. c. 12, Iuvenculas.
[33] Pars I, C. XXVIII, qu. 1 (I, 1078).
[34] c. 7, Quanto te novimus, X, De divortiis, IV, 19 (II, 722).
[35] *Ibid.*
[36] c. 2, C. XXVIII, qu. 2 (I, 1090).

Item, I Cor. VII, "Si infidelis discedit, discedat, non est enim frater vel soror[37]." Ergo. etc.

Secundo, quia matrimonium fidei et caritatis quod est inter animam et Deum iuxta illud, "Sponsabo te mihi in fide[38]," est separabile usque ad consummationem in gloria, et separetur etiam multotiens. Ergo, a simile carnale matrimonium est dissolubile usque ad consummationem, quae est per copulam carnalem. Ergo, matrimonium contractum per verba de praesenti sive consensus huiusmodi dissolvi potest.

Contra. I Cor. VII, "Praecipio non ego sed Dominus uxorem a viro non discedere[39]," etc.

Item, I Cor. VI, "Mulier vivente viro allegata est lege viri[40]."

Item, XXXII, Q. VII, Interveniente[41], argumentum ad idem.

Respondeo, XXXVIII, Q. I, non est ratum[42]. Triplex distinguitur matrimonium, legitimum et ratum, ratum et non legitimum, legitimum et non ratum. Legitimum et ratum est inter fideles, et est legitimum quia fit secundum mores patriae vel secundum solemnitatem Ecclesiae, aut quia fit inter legitimas personas; ratum quia in fide, quia fides ratificet; ratum et non legitimum est quod est inter fideles, tamen vel non secundum mores patriae celebratur vel sollemnitates Ecclesiae, vel fit inter tales personas quae habebant impedimentum impediens contrahendum, quamvis non dirimat contractum, quia si dirimaret contractum iam nec ratum nec matrimonium esset; legitimum et non ratum est sicut ibi dicitur inter infideles qui legitimae personae dicuntur, quia contrahunt secundum mores patriae suae; ratum tamen non est, quia non est in fide. Tale coniugium dissolvitur ut dicitur ibi lege fori non lege poli, quia secundum mores suas dato libello repudii separantur ab uxoribus. Tamen secundum ius divinum est inter eos vinculum indissolubile, si tamen legitimae sint personae, nisi in casu a superiori, scilicet a Deo solvatur. Et ad hoc notandum quod aut infidelitas praecedat matrimonium aut matrimonium infidelitatem, sicut cum ambo vel alter coniugum labitur in haeresim vel infidelitatem. Si primo modo aut ambo remanent in infidelitate, et sic si personae sint legitimae separari non possunt de iure divino, etsi secundum mores patriae suae aliquando separentur, sicut loquitur capitulum Non est ratum[43]. Aut

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[37] I Cor. 7, 15.
[38] Osee 2, 20.
[39] I Cor. 7, 10.
[40] *Cf.* I Cor. 7, 39.
[41] c. 1, C. XXXII, qu. 7 (I, 1140).
[42] *Decret. Grat.* C. XXVIII, qu. 1 (I, 1078).
[43] *Ibid.*

ambo convertuntur ad fidem et sic magis est indissolubile quam prius, quia ratificatur per fidem. Aut alter illorum tantum convertitur ad fidem, et tunc est distinguendum, quia aut ille qui non convertitur vult cohabitare sine contumelia creatoris, et sic indissolubile est adhuc, aut non vult habitare sine contumelia creatoris, et tunc dissolubile est huiusmodi matrimonium, et a Deo dissolvitur, quia contumelia creatoris ius solvit matrimonii, sicut habetur capitulo Si infideles[44], et Extra. Quanto[45], ubi dicitur quod tunc qui fidelis est potest contrahere cum altero vivente adhuc primo coniuge. Si matrimonium praecedit infidelitatem, aut uterque labitur in infidelitatem, et sic indissolubile est sicut inter infideles, aut alter tantum et sic distinguendum ut prius, quia infidelis aut vult cohabitare fideli sine contumelia et sic separari non debent, nec simpliciter nec quantum ad thorum, aut non vult sine contumelia creatoris cohabitare, et tunc separari potest quantum ad vinculum, non tamen simpliciter. Immo, altero vivente, alter cum alio ab illo contrahere non potest. Quae dicta sunt confirmantur per rationem et per iura, XXVII, Q. I, Non est ratum[46], et Q. II, Si infidelis[47], et XXXII, Q. VII, Interveniente[48], et Extra. Qui matrimonium possunt[49].

His praehabitis dicimus quod matrimonium sive consensus de praesenti, dum tamen fit inter personas legitimas, quamdiu supersunt coniuges simpliciter est indissolubile, etsi in casu solvatur aliquando a Deo.

Ex dictis plures satis intelliges auctoritatum et rationum ad utramque partem excepto quod ad illud quod obicitur quod matrimonium spirituale semper est dissolubile usque ad consummationem, ergo etc., dicendum quod non est simile de matrimonio spirituali et carnali quia matrimonium spirituale ponit coniunctionem cum Deo, non tantum de iure sed etiam de facto. Aliter enim non coniungitur continue anima sponsa cum Christo Sponso nisi per caritatem. Unde oportet esse ibi vinculum actuale iuxta illud "Qui adhaeret Domino unus," etc.[50] Circa autem matrimonium carnale non ponit nisi coniungi de iure, non de facto, nec quantum ad mentes nec quantum ad corpora, quia si quantum ad mentes, tunc inter odio se habentes non esset coniugium. Iterum, si quantum ad corpora esset coniugium inter coniuges, esset solum dum commiscentur, quia patet quod non est ibi vinculum actuale, sed solum iuris sufficit.

[44] *Decret. Grat.* c. 2, C. XXVIII, qu. 2 (I, 1090).
[45] c. 7, Quanto, X, De divortiis, IV, 19 (II, 722).
[46] *Decret. Grat.* C. XXVIII, qu. 1 (I, 1078).
[47] c. 2, C. XXVIII, qu. 2 (I, 1090).
[48] c. 1, C. XXXII, qu. 7 (I, 1140).
[49] *Cf. Extra.* IV, t. 18 (II, 717 ff.).
[50] I Cor. 6, 17.

Ad alia autem exiguuntur non tantum vir sed femina, et ideo quia in potestate nostra est disiungi de facto in spirituali, quia possumus cum volumus non inhaerere Deo, ideo illud potest solvi. Sed aliud, in quo semel consensimus et nos servum alterius facimus, et sic de iure nos ligamus supra nostrum velle, et ideo a nobis solvi non potest, Non est igitur simile, quia minus exigitur ad solutionem spiritualem, quia solvi de facto sufficit ibi, quam ad solutionem carnalem, ubi non sufficit solvi de facto quod possumus, sed solvi de iure quod non possumus; et ideo simpliciter est dicendum quod illud est indissolubile.

Circa consummationem matrimonii quattuor quaeruntur.

Primum est, utrum copula carnalis sit de essentia matrimonii; secundum, utrum matrimonium consummatum est per copulam carnalem; tertium, utrum solum per copulam vel aliud; quartum, utrum post consensum de praesenti, statim unientur coniuges ad reddendum
f. 224va debitum carnalis copulae. |

Circa primum si quid minus videtur esse, est et quid magis. Sed consensus amborum minus videtur esse de essentia matrimonii quam copulam corporum, et tamen est de essentia illius, ergo etc. Probatio mediae dicitur in Summa de matrimonio[51]. Dicunt iuristae quod matrimonium primum ad cuius exemplar sunt alia tunc fuit institutum inter primos parentes quando Adam dixit, "Hoc nunc os de ossibus meis et caro de carne[52]," non quando dixit Deus, "Crescite et multiplicamini[53]" etc.; immo non fuit nisi quasi benedictio nuptialis. Sed constat quod istud, "Hoc nunc os" etc. magis respicit copulam corporum quam animorum, quia in copula corporis fiunt proprie una caro.

Contra. Nihil est de essentia alterius sine quo potest esse alterum, id est sine quo non existente existit alterum. Sed sine copula carnali existente adhuc est matrimonium, XXXII, Q. VII, interveniente[54], ergo, etc.

Respondeo. Possumus loqui de matrimonio vel in quantum sacramentum, vel in quantum coniugium. Si in quantum sacramentum, sic copula carnalis est de essentia illius. Quia matrimonium in quantum sacramentum institutum est principaliter ad signandum coniunctionem Christi et Ecclesiae quae est per unionem duarum naturarum in Christo, non ad significandum coniunctionem animae cum Deo, quia sacramentum et ex similitudine repraesentat et ex institutione significat. Dico ergo quod matrimonium quantum ad consensum animorum principaliter

[51] Non inveni.
[52] Gen. 2, 23.
[53] Gen. 1 F 8 (1, 28)
[54] c. 1, C. XXXII, qu. 7 (I, 1140).

repraesentat coniunctionem animae ad Deum vel ad Christum in quantum Deus, non in quantum Verbum Incarnatum, nisi ex consequenti, scilicet, in quantum caritas sua movet ipsum ad uniendam sibi nostram naturam, ut coniungeretur Ecclesiae sicut sponsae. Hanc inquam coniunctionem scilicet animae ad Deum vel ad Christum in quantum Deus, repraesentat consensus animorum per verba de praesenti ex similitudine, sed non significat ex institutione, quia ad hoc non est matrimonium institutum, sed in quantum matrimonium institutum est ad significandum Christi et Ecclesiae sacramentum, id est, coniunctionem Christi et Ecclesiae quae est per unionem duarum naturarum in Christo, et quia hanc unionem vel coniunctionem figurat per carnalem copulam corporum non per copulam animorum, ideo in quantum sacramentum est de essentia matrimonii copula carnalis; hoc patet XXVII, Q. II, Cum societas[55], quod habetur etiam in Littera[56]. Si autem consideretur matrimonium in quantum coniugium, non in quantum sacramentum, sic uno modo copula carnalis est de essentia illius, alio modo non, quia aliquid potest esse de essentia alterius dupliciter, aut per se et primo, et sic solum principia rei sunt de essentia rei, ut de essentia animae et hoc modo est solum suum quod est, et suum quo est, non suae potentiae; alio modo dicitur de essentia rei quod est per se, etsi non primo, et hoc modo sunt potentiae animae de essentia animae, quia etsi sine illis non potest esse, tamen non sunt de prima rei compositione, sed sequuntur primum esse et sunt quasi de bene esse, quia comparant animam ad operari et ad finem suum. Sic dico quod loquendo de essentia matrimonii per se et primo non est de essentia illius nisi consensus per verba de praesenti; loquendo tamen de essentia matrimonii alio modo, scilicet secundum quod dicitur de essentia esse quid per se etsi non primo, scilicet quia sequitur primum esse et dat bene esse et completum vel consummatum quia comparat ad finem, sic carnalis copula est de essentia matrimonii, quia per carnalem copulam est ibi omnimoda inseparabilitas et perpetuitas, et ordinatur ad suum finem, scilicet ad bonum prolis.

Quod ergo primo obicitur de institutione primi matrimonii, dicatur quod tunc erat matrimonium institutum in officium, non in remedium, et quia quantum ad officium est, et praecipue tunc esset ad multiplicationem hominum sive fidelium quae fit per copulam carnalem, ideo tunc debuit forma instituendi tangere principaliter copulam carnalem. Nunc autem quia spirituale est, secundum quod dicit Apostolus[57], qui uxores

[55] c. 17, Cum societas, C. XXVII, qu. 2 (I, 1066).
[56] Lombard, *IV Sent.*, Dist. XXVI, (ed. cit. II, p. 914 ff.).
[57] I Cor. 7, 29.

habent sint quasi non habentes, ex quo praecipue Beata Virgo continentiam huiusmodi incepit, debuit forma verborum talis esse quae ita de plano non tangeret copulam carnalem, sed magis spirituale esse debuit, sicut est forma quae ita expresse non tangit carnalem copulam, sicut illa, "Haec nunc os," etc.[58]

Alia duo argumenta ad oppositum procedunt secundum quod esse de essentia alicuius est esse de essentia illius primo et per se, et non secundum quod dicit esse de essentia alterius per se etsi non primo.

Illud autem quod adducitur ad primum non facit ad propositum quia non dicitur ibi quod matrimonium posset esse sine omni copula carnali, quia non loquitur generaliter de copula carnali.

UTRUM MATRIMONIUM CONSUMMATUR PER COPULAM CARNALEM?

Circa secundum, Ambrosius et Herodotus in hoc quarto infra Dist. XXX, Cap. Inter quos[59], et dicitur ab Ambrosio in Libro de Patriarchis, et habetur XXVII, Q. II, In omni matrimonio[60], In omni matrimonio coniunctio intelligitur spiritualis quam firmat et perficit coniunctorum permixtio corporalis. Ergo, matrimonium consummatur per carnalem copulam.

Contra. Consummans nobilissime et dignius consummat. Sed coniunctio carnalis non est dignior coniunctione spirituali quae est per coniunctionem animorum secundum quod dicit Augustinus[61] quod sanctiora sunt coniugia pari voto continentium. Ergo, copula carnalis non est consummatio consensus vel communionis animorum.

Respondeo. Consummatio matrimonii est per copulam carnalem sive consideretur in quantum sacramentum sive in quantum coniugium. In quantum sacramentum enim consummatur per illam, quia in quantum sacramentum est ad consignificandum illam perfectissimam et beatissimam coniunctionem Christi et Ecclesiae[62], sive desponsationem quae fit per unionem divinae et humanae naturae in Christo quam non figurat donec copula carnalis accedit. In quantum coniugium similiter per illam consummatur, quia coniunctio animorum non est ita perfecta unio illorum ad invicem sicut est coniunctio corporum. Imo illa animorum ordinatur ad illam corporum, et haec consummativa est.

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[58] Gen. 2, 23.
[59] Cf. Lombard, *IV Sent.*, Dist. XXX (ed. cit. II, 932 ff.).
[60] c. 36, In omni matrimonio, C. XXVII, qu. 2 (I, 1073).
[61] Lombard, *IV Sent.*, Dist. XXX, (ed. cit. II, p. 932).
[62] Cf. Eph. 5, 22 ff.

Quod ergo primo obicitur quod consummans nobilius est, dicatur quod possumus loqui de his duabus unionibus vel coniunctionibus coniugum, scilicet carnali et mentali, vel quantum ad ea quae uniuntur, vel quantum ad modum vel genus unionis, vel coniunctionis; primo modo dignior est mentalis, quia ibi coniungitur spiritualis natura cum spirituali, in alia corporalis cum corporali. Et spiritus constat dignior est natura quam corpus. Secundo modo, scilicet in genere unionis vel coniunctionis, nobilior est et dignior quae est corporum quam quae animorum tantum. Quae quidem unio corporum est secundum rem et non tantum secundum intentionem sicut alia, et nobilius et perfectius coniunguntur quae coniunguntur secundum rem quam quae secundum intentionem tantum coniunguntur, et coniunctionem corporum attende quantum ad naturam, non quantum ad miseriam quae ibi est.

UTRUM SOLUM PER COPULAM CARNALEM CONSUMMATUR MATRIMONIUM?

Circa tertium, ubi finis sub fine, si finis est consummare, hoc est ultimi finis et exterioris, vel ad minus maxime ultimi finis est consummare; sed copula carnalis est in matrimonio ad prolem habendam. Ergo, prolis, non tantum carnalis copula, consummat matrimonium.

Quod autem matrimonium sit ad prolem habendam habetur XXXII, Q. II, Pudor est, et XXXII, Q. III[63], Sicut non omnis.

His ita respondent[a]. Secundo quia inter Beatam Virginem et Ioseph fuit perfectissimum matrimonium, sicut habetur XXVII, Q. II, Si quid[64]. Cum ergo, et ibi Cap. Omne itaque[65], et tamen non fuit ibi carnalis copula sed votum virginitatis. Ergo, non solum etc.

Tertio, quia initium respondet fini, vel consummationi. Ergo, cum matrimonium pluribus modis initietur, vel nuda promissione, subarratione, etc., ergo et pluribus modis, non tantum uno possit consummari. Quarto, consummatur matrimonium quando coniuges fiunt una caro. Sed magis sunt una caro cum habent prolem, quia tunc sunt una caro in se et in alio. Ergo, tunc est maxime matrimonium. Et ita etc.

Contra. Matrimonium usque ad carnalem copulam est perfectibile, non perfectum; post est perfectum non ulterius perfectibile. Ergo,

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[63] c. 1, Pudor est, C. XXXII, qu. 2 (I, 1119), and ibid. c. 2 (ibid. 1120).

[64] c. 3, Beata Virgo, C. XXVII, qu. 2 (I, 1063). With reference to the matrimony of Our Blessed Lady and St. Joseph, cf. the text edited from this present ms., Kilian F. Lynch, O. F. M., *De matrimonio Mariae et Ioseph*, Franciscan Studies, 15 (March, 1955) 79 ff.

[65] *Decret. Grat.* c. 10, C. XXVI (I, 1065).

[a] Mutil.

cum tale sit consummatum, videtur quod carnalis copula consummat matrimonium. Cum autem post carnalem copulam non sit perfectibile patet, quia si sic, nonnisi per prolem. Per prolem autem non consummatur, quia hoc non est in omni matrimonio. Unde accidit matrimonio et perficit. Ergo, non esset consummatum matrimonium donec habetur proles. Ergo, semper ante prolem licet transire ad alia vota, quia semper licet illud ante consummationem matrimonii.

Respondeo. Matrimonium consummatur per solam copulam carnalem, quia illud consummat matrimonium ad quod matrimonium per se habet potentiam, sive ad quod est per se, et ad illud sicut ad ultimum per se ordinatur. Hoc autem est copula carnalis, quia ad hoc ultimo per se possunt coniuges, non autem possent per se in prolem, et ideo non proles sed coniunctio carnalis consummat.

Quod ergo primo obicitur quod proles est finis ulterior, ergo etc., dico quod est finis intra et finis extra, ut fabrilis facere frena, frenus est intra, utilitatis vero est eius finis extra; finis autem intra ultimus, non finis ultimus extra, consummat. Quia ergo prolis non est finis ultimus, intra matrimonii sed extra, copula vero carnalis finis ultimus intra, ideo non prolis sed copula carnalis consummat.

Ad aliud dicatur quod aliter est de illo matrimonio et de omni alio,
f. 224vb quia quod in aliis facit proles suscepta in | matrimonio de viro proprio, hoc ibi fecit proles suscepta de Spiritu Sancto. Quamvis enim matrimonium congruentiam habeat ad hoc quod per carnalem copulam consummatur, tamen necessitatem habet haec consummatio ab institutione divina. Unde consummatio matrimonii et est ab institutione divina vel lege, et quia Deus instituerat quod de matrimonio consummato et perfecto nasceretur, consummato dico non lege communi aliorum, sed lege privata, scilicet per susceptionem eius quod in aliis praesupponebat de necessitate consummationem, ideo dico quod tantum fecit ibi proles suscepta de Spiritu Sancto quantum in aliis proles suscepta de iure proprio. Unde omnia bona quae sunt in aliis matrimoniis consummatis ibi fuerunt per excellentiam, propter quod maxime fuit consummatum, quamvis ergo non fuerat carnalis copula, fuit tamen ibi quod maius est quantum ad consummationem quando carnalis fit copula. De omnibus ergo aliis matrimoniis illud argumentum teneret; de illo vero non valet.

Ad alia, quamvis secundum suas intentiones sibi invicem respondeant principium et consummatio vel finis, tamen non secundum rem ita est, quod in aliquibus similiter non respondent, sed potest aliquis pluribus initiari quod uno solum consummatur, et hoc propter imperfectionem principii, ut vita aeterna quamvis sit unum pluribus tamen modis potest

mereri, sicut omnia quae per generationem et successionem exeunt in esse, pluribus modis possunt initiari propter imperfectionem principii, tamen unum est quando consummatur.

UTRUM STATIM TENEANTUR REDDERE DEBITUM

Circa quintum, in consensu transfertur dominium cuiuslibet ad alterum. Ergo amplius non habet potestatem sui. Ergo statim tenetur alteri petenti debitum, nec potest resistere. Secundo, quia per morem nihil iuris acquiritur in matrimonio alterius in alterum. Imo a principio consensus illius habet quodlibet matrimonium quidquid iuris potest habere ad minus quidquid potest habere ante carnalem copulam. Ergo, aut statim tenetur ad carnalem copulam, aut numquam. Sed non est dicere quod numquam; ergo, statim.

Contra. Matrimonium initiatum non statim necesse est ratificari. Ergo, nec ratum necesse est statim consummari.

Respondeo. Non statim tenentur coniuges ad solutionem debiti, et ratio est quia cum nullus teneatur statim renuntiari iuri suo, et ipsi habeant adhuc ius transeundi ad meliorem vitam, invito alio coniuge cui iuri renuntiatur in carnali copula, ideo non statim solvere tenentur.

Est etiam ratio quia scilicet factum arduum et deliberationem et dilatationem exigit temporis, et est simile in matrimonio carnali et spirituali quantum ad hoc, quia in spirituali scilicet quando quis intrat religionem antequam matrimonium illud consummet per professionem, conceditur ei de iure tempus deliberationis, Extra. De transeuntibus ad religionem, Statuimus[66]; similiter et in carnali est tempus indultum antequam consummetur.

Quod ergo primo obicitur dico quod in matrimonio sunt duo, scilicet quiddam negativi praecepti quod est alteri igitur viro suo commisceri, et quiddam affirmativi scilicet isti viro inseparabiliter inhaerere. Quantum ad primum transit dominium statim, in consensum per verba de praesenti, quia nec mulier habet ultra potestatem corporis sui, ut cum alio nubat, nec vir ut cum alia, et quantum ad hoc bene procedit ratio, sed quantum ad secundum non statim transit potestas, immo deliberare potest, ut dictum est, et post deliberationem vel isti inseparabiliter per carnis copulam inhaerere, vel ab isto ad amplexus spiritualis Sponsi transire. Unde ad primum tenetur semper et ad semper, scilicet ut alteri non commisceatur donec celebretur divortium inter eos.

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[66] c. 23, Statuimus, X, De regularibus et transeuntibus ad religionem, III, 31 (II, 578).

Ad secundum autem, scilicet isti commisceri, in se probabiliter dicitur semper licet intrare religionem, sed non ad semper, quia non donec post deliberationem.

Ad illud quod ratione huius potest quaeri quantum temporis est indulgendum, respondeo secundum ius determinatum Extra. De censuris, Ex publico[67], certum indulgentur duo menses secundum apparatum[68], tamen pro arbitrio iudicis est plus vel minus de tempore indulgendum secundum quod sibi videbitur expedire, et huius ratio potest esse quia in talibus possunt multi casus accidere qui non possunt cadere sub scientia, nec de ipsis regula potest poni, sed iudicis peritia debet esse pro regula in talibus. Unde, illae tres <quae> in decretali alligata assignantur non intelligentur praecise, sed huius tres est arbitrio iudicis et circumspectioni illius relinquendum. Unde plus non potest vel minus de tempore deliberationis coniugum indulgere. Et nota secundum apparatum[68a] quod si contingeret alterum coniugum post tempus sibi ad deliberationem indultum neutrum velle facere, scilicet, nec intrare religionem nec debitum alteri coniugi reddere, non posset ei iudex terminum alium sine consensu alterius coniugis assignare sed de voluntate alterius posset bene iterum alium terminum indulgere, ut Extra. De regularibus et transeuntibus ad religionem, Statuimus[69].

Post haec advertendum est quid sit coniugium[70]. Hic incidunt casus et quaestiones quasi circa litteram.

Prima circa hoc quod dicitur ibi efficiens causa matrimonii est consensus non quilibet sed per verba expressa, nec de futuro sed de prae-
f. 225ra senti. | Et circa hoc primo quaeritur si impuberes contrahunt per verba de praesenti, utrum fiat aliquid vel non, et hic dico impuberes supra septem et infra duodecim et quattuordecim ita quod in eis malitia non supplet aetatem.

Quod nihil fiat videtur, quia non matrimonium quia aetas debita non adest, non sponsalia quia non est forma verborum quibus contrahitur.

Contra. Cum aliquis contrahit cum aliqua dicens "Ego accipio te in meam," non datur intelligi nec important verba quod solum suam fit in praesenti sed semper, et sic est in futuro. Ergo, in illa forma verborum de praesenti intelligetur illa de futuro. Ergo, si inter istos im-

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[67] c. 7, Ex publico, X, De convers. coniug. III, 32 (II, 581).
[68] *Cf.* apparatus *ibid.*, ed. Venetiis, 1584, col. 1261.
[68a] *Cf. ibid.*, col. 1261.
[69] c. 23, Statuimus, X, De regularibus et transeuntibus ad religionem, III, 31 (II, 578).
[70] Cf. Lombard, *IV Sent.* Dist. XXVII, (*ed. cit.* II, p. 916).

puberes non valeat de praesenti, valet pro futuro; ergo, saltem sponsalia contrahuntur. Hoc idem dicit expresse Extra. De spons. impuberum, Tuae nobis[71].

Respondet Magister[72] quod aut illi intendunt contrahere matrimonium simpliciter, aut intendunt facere quod possunt, ut si dicerent, "Contraho tecum si possum, si non, valeat quod valeat." Primo modo nihil faciunt; secundo modo contrahunt sponsalia.

Sed hoc non videtur sufficere, quia si verba illa non habent in se quod possint inter illa contrahi sponsalia, ergo ex hoc quod illi addunt, valeat quod valeat, nihil fit amplius nisi quod valeant verba. Sed verba istud non habent in se sicut supponunt, cum dicit quod cum simpliciter proferuntur et intendunt contrahere nihil agitur. Ergo, nec illa additione facta adhuc aliquid agitur. Ergo, simpliciter nihil agitur inter eos quod est contra decretalem praeallegatam. Propter quod dicatur quod simpliciter contrahuntur inter illos sponsalia, sicut dicit decretalis[73], et ratio dicta est iam, quia cum quis dicit "Accipio te in meam," intelligitur quod fit sua, et quod erit sua, et sic in illa forma intelligitur futurum, et sic forma sponsalium intelligitur ibi habitualiter, etsi non actualiter exprimatur sub propriis verbis, quia illam potest accipere de futuro etsi non de praesenti, et sunt inter eos contracta sponsalia, non matrimonium.

Secundum quaeritur circa hoc. Ponatur quod iste cum illa exprimit verba consensus de praesenti, dicens, "Accipio te in meam," et illa bona fide respondeat, "Et ego te in meum," iste tamen mentitur et defraudat istam, quia non intendit dicere verum, nec contrahere cum illa nec consentit corde, sed dissentit corde; ad hoc profert illa verba ut extorqueat carnalem copulam; quaeritur utrum sit matrimonium, et utrum sit alligatus mulieri illae per matrimonium?

Quod sic videtur, quia Augustinus[74] vult quod cum quis fraudulenter iurat aliquid sic iuramentum Deus accipit sicut ille cui iuratur intelligit. Ergo, similiter hic Deus istam promissionem sic accipit sicut illa cui promittitur intelligit. Ergo, sicut illam intelligit similiter istum teneri, sic apud Deum tenetur. Ergo, est ibi matrimonium.

Praeterea, Extra. De spons., Ex litteris[75], ibi dicitur quod cum alter non intelligit quod alteri proponit, debet cogi utrumque verborum illum sensum tenere, quem solent recte intelligentibus generare, et loquitur

[71] c. 14, Tuae nobis, X, De despons. impub. IV, 2 (I, 678).
[72] Cf. Lombard, *IV Sent.*, Dist. 27 (*ed.* Quaracchi, II, p. 917).
[73] Cf. n. 71.
[74] Non inveni.
[75] c. 7, Ex litteris, X, De spons. IV, 1 (II, 663).

sponsalibus. Ergo, similiter vel magis hic debet esse. Sed recte intelligentes verba prolata iudicarunt hoc esse matrimonium. Ergo, etc.

Contra hoc est quia ibi non est mutuus consensus. Ergo, ibi est defectus causae matrimonii. Secundo, quia hic dicit Extra. De spons., Tua nos fraternitas[76], ubi ponitur expresse iste casus, et respondetur quod non est matrimonium, quia ibi non fuit consensus sine quo caetera sequentia nequeant perficere coniugale.

Credo tamen quod nec in voto nec in aliqua promissione tenetur fraudulenter proferens consensum non intendens facere quod dicit ad id implendum quod dicit quantum ad Deum, sed tamen peccat sic dicendo et bene faceret implendo si sit in statu quo illud possit adimplere. Et hoc est quia exterior consensus non est nisi signum interioris, interior autem est obligans. Propter quod videtur quod illa ratione praedicta non sit ibi matrimonium sed alia ratione, quia scilicet in matrimonio et est perhibitio assensus proprii, et est acceptio assensus vel consensus alterius, et hoc ultimum est consummativum consensus efficientis matrimonium. Unde si ipse possit dare suum assensum sine hoc quod reciperet assensum alicuius, non esset ibi matrimonium quia non esset mutuus consensus, et claudicaret matrimonium quod esse non potest. Oportet ergo ad hoc quod sit consensus efficiens matrimonium, et quod iste suum assensum praebeat illi quod accipit eam in suam, et quod illa recipiat assensum alterius, in hanc rem, id est quod illa se concedat in suam, et iste hanc recipiat. Cum ergo iste ficte dicit quod accipiat illam in suam, et illa vere respondet quod accipit eum in suam, aut iste non intendit proferre suum assensum nec recipere assensum illius, et sic non est matrimonium, aut licet non praebeat suum, tamen intendit recipere assensum alterius credens quod non ligetur illi, nisi praebeat suum, et sic se decipit quia recipiendo illam in uxorem, dat se illi in virum, quia vir et uxor relative se habent in hoc, quia non potest esse uxor huius quin iste sit vir illius. Et ideo si iste recipit consensum istius ut sit eius uxor, ex consequenti dat suum ut sit vir illius. Et sic est matrimonium inter eos, sicut iste non potest velle esse pater istius, quin velit quod iste sit filius eius. Secundum alium modum non est matrimonium inter eos.

Ad primum ergo dicatur quod non est simile de obligatione quae est
f. 225rb in matrimonio et quae est in iuramento, | quia illa est in foro Dei, quia invocatur prima veritas testis, et ideo semper tenetur facere quod dixit, dummodo iuraret licite, quia numquam est veritas testis nisi de vero,

[76] c. 25, Tua nos duxit fraternitas, **X**, De sponsalibus et transeuntibus, IV, I, (II, 670).

et ideo oportet quod verificet quod dixit ne quantum in se est et faciat veritatem mendacem. Sed in matrimonio est obligatio homini non invocata prima veritate in testimonium, et ideo si non intendit facere quod dicit ‹sed› solum mentitur vel defraudat, non obligatur necessario ad hoc faciendum, nisi quod quamdiu est in statu quo illud potest complere debet sibi consuli quod faciat et impleat quod promisit, nisi ibi esset periculum alterioris status, ut si velit religionem intrare.

Ad capitulum dicatur quod sic loquitur non quod iste vel ista teneatur simpliciter ad implendum votum religionis quod fraudulenter fecit, sed loquitur ad terrorem et in paenam hoc infligendo, ut ad hoc talis fraudulentus cogatur, ne scilicet si non cogatur, similem audaciam sic agendi alii accipiant, et sic sacramenta Ecclesiae communiter contemnantur hac occasione, ut patet ibi.

Ad decretalem[77] dicatur quod loquitur non in foro Dei sed causarum sive exteriori, in quo est pro matrimonio standum, nisi iuramentum esset in contrario quod pro illo statu non posset, argumentum, Extra. De spons. Tua nos fraternitas[78]. Quae adducta sunt in contrarium concedimus.

Postea quaeritur utrum inter absentes possit contrahi matrimonium?

Quod non videtur quia ibi non potest servari forma verborum quibus debet exprimi consensus, quia vir potest dicere "Accipio te," etc., et alia similiter "Accipio" etc.

Item, non est idem tempus prolationis mandatoris et procuratoris.

Contra. XXXII, Q. II, Cap. Non omnis[79]. Cum ergo ubi habetur quod virginalis pudoris non est eligere maritum etc. Ambrosius in Libro de Patriarchis[80]. In Genesi[81] etiam legitur de matrimonio Isaac et Rebecca quod inter absentes promissione mediante fuit contractum. Praeterea, desponsatio humanae naturae a Christo vel Verbo mediante angelo Gabriele misso ad virginem[82] quasi mediatore fuit facta. Cum ergo matrimonium carnale sit signum et sacramentum illius, potest inter absentes contrahi.

Quod concedimus, cuius ratio est quia omnis habens auctoritatem super aliquid potest illud alteri committere, argumentum Extra. De officio legati, Eis[83]. Quia ergo iste solus habet auctoritatem et potestatem voluntatis suae, quantum ad hoc factum potest illa (*read* ille) committere

[77] *Cf. supra* n. 75.
[78] c. 26, Tua nos duxit fraternitas, X, De sponsalibus, IV, 1 (II, 670).
[79] Decret. Grat. c. 12, Non omnis, XXXII, 2 (I, 1123).
[80] Cf. c. 13, Honorantur, C. XXXII, qu. 2 (I, 1124).
[81] Gen. 24, 33.
[82] Lk. 1, 26.
[83] *Extra.* II, 183.

procuratori de latere illam voluntatem (*add* et per procuratorem) ad mulierem, et vice mariti recepitur(!) ‹recipit› mulieris consensum, et sic potest contrahi matrimonium inter absentes.

Quod ergo primo contra hoc obicitur quod non potest servari forma, dicatur quod de forma consensus sive de verbis exprimentibus consensum, possumus loqui per comparationem ad eum qui committit vel per comparationem ad eum cui committuntur. Primo modo non servatur illa forma, et sic procedit ratio; secundo modo servatur, quia etsi non per seipsum exprimit vir consensum suum, mulier tamen per procuratorem exprimit, et est ei mulier praesens si non corpore spiritu tamen.

Ad aliud quod non est idem tempus, possumus loqui vel de tempore quo verba procuratori committuntur, et sic non est idem tempus, vel de tempore quo procurator verba sibi commissa deponit et consensum mulieris vice viri recipit, et sic idem tempus; potest ergo sic inter absentes etc.

Consequenter quaeritur circa illud capitulum[84] *Quod vero sponsam*, pro eo quod ibi tangitur quod ante carnalem copulam potest alter transire ad religionem nolente alio, et quaeritur utrum verum sit?

Quod sic dicunt plura iura, Extra. De conv. coniug., Ex publico, et habetur ad hoc XXVII, Q. II[85].

Sed contra. Inconveniens est ad quod sequitur inconveniens. Sed ad hoc sequitur inconveniens, scilicet quia si mulier transit ad religionem, potest ducere alium, quia absolutus est ab illa, argumentum, Extra. De conver. coniug., Ex publico[86], Ceterum, si ad religionem transierit, etc., ergo cum illa infra suum tempus probationis possit redire ad saeculum, Extra. De transeuntibus ad religionem, Statuimus[87], poterit assumere virum alium, et sic utroque manente in saeculo contingit eos aliis alligari, et primum matrimonium dissolvi viventibus coniugibus. Quod est inconveniens, quia si vis dicere quod remanens in saeculo non potest accipere coniugem usque ad annum, et expondenda est illa decretalis[88] quae videtur dicere quod statim potest, ad minus hoc sequitur inconveniens quod remanens in saeculo sine sua culpa gravamen sustinet, cum cogitur expectare usque annum quod prius facere nolebat, sed ducere uxorem vel habere illam quam duxerat.

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[84] Cf. Lombard, *IV Sent.*, Dist. XXVII, (*ed. cit.* II, p. 919).
[85] c. 7, Ex publico, **X**, De convers. coniug., III, 32 (II, 580), and *Decret. Grat.* C. XXVII, qu. 2 (I, 1062 ff.).
[86] c. 7, Ex publico, cf. n. 85.
[87] c. 23, Statuimus, **X**, De regularibus et transeuntibus ad religionem, III, 31 (II, 578).
[88] Cf. *ibid.*

Consequenter quaeritur quia in illo capitulo[89] et in sequenti tangitur quod post carnalem copulam potest alter transire ad religionem si alter remanens in saeculo det cautionem quod continebit, et quaeritur utrum sit verum vel non?

Quod sic, argumentum Extra. De conver. coniug. Praeterea uxoratus[90].

Quod non, XXVII, Q. II, Quia Agathosa[91] ubi habetur pro inconvenienti quod cum per copulam carnalem facti sint unum corpus altera pars illius corporis transeat ad religionem, altera in saeculo remaneat.

Ad idem est, eadem quaestione, Sunt qui dicunt, Quia Agatho, Scripsit nobis[91a], Extra. De convers. coniug. Cum sis, 1 et 2[92]. Pone etiam quod iste ducat per verba de praesenti, et iurent sibi super sacrosancta numquam se invicem dimissuros, tunc quaero utrum possit alter ante carnalem copulam nolente illa ad religionem transire? Similiter est casus si ambo possunt transire?

Quod non videtur quia licet unicuique renuntiare iuri suo, Extra. De regularibus et transeuntibus ad religionem, Statuimus[93], et argumentum De convers. coniug. Quidam[94]. Ergo, licitum est quod iuravit. Ergo iuramentum de licito semper observare tenetur.

Contra, Semper licet melius facere et ad alteriorem statum ascendere, si fieri potest. Sed ante carnalem copulam licet etiam nolente uxore. Ergo, iurando contra hoc iuravit illicitum. Ergo, non tenetur. Ergo, potest transire.

Respondeo. Ad primum casum dico quod potest alter coniugum post consensum de praesenti transire ad religionem altero invito, quia adhuc post consensum illum est matrimonium imperfectum, et potest consummari per fortius vinculum, et hoc vel per carnalem copulam, vel per ingressum religionis secundum quod supra notum est in illo problemate, "Utrum carnalis copula sit de essentia matrimonii?"[95], in responsione secundi articuli illius problematis.

Quod ergo obicitur in contrarium dico quod ille qui remansit in saeculo aut reclamat et petit coniungere, aut non curat vel negligit. In

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[89] Cf. Lombard, *IV Sent.*, Dist. XXVII, cap. VI—VII (ed. cit. II, 719 ff).
[90] c. 1, Praeterea, **X**, De convers. coniug., III, 32 (II, 597).
[91] c. 25, Quia Agatho, C. XXVII, qu. 2 (I, 1070).
[91a] *Decret. Grat.* c. 19, Sunt qui dicunt, c. 25, Quia Agatho, c. 26, Scripsit nobis, C. XXVII, qu. 2 (I, 1067—70).
[92] c. 4, Quum sus, **X**, De convers. coniug., III, 32 (II, 579).
[93] c. 23, Statuimus, **X**, De regularibus et transeuntibus, III, 31, (II, 578).
[94] c. 3, Quidam, **X**, De convers. coniug. III, 32 (II, 579).
[95] Cf. supra

secundo casu tenetur expectare usque ad completionem improbationis nisi ante reclamat, et ex tunc si ille ante profiteatur religionem potest alter contrahere et sic intelligitur illa decretalis, Ex publico[96], quia non transit ad religionem antequam professionem faciat, sed ad probationem religionis tantum. Si autem revertatur ante professionem semper tenetur ipsam recipere. Si autem reclamat, remanens in saeculo, potest facere illum cogi qui intravit religionem quod acceleret professionem ad vitandum periculum remanentis in saeculo.

Ad id quod quaeritur dicatur quod quia coniugibus numquam praecluditur matrimonium quin ad minus de consensu mutuo, possint altiorem vitam eligere, sed oportet quod sicut una caro et unum corpus per carnalem copulam sint effecti, ita unum semper habeant voluntatem vel in generali, vel in speciali, et ideo numquam potest unus transire ad statum conciliorum utpote castitatis vel religionis nisi alter velit ad eundem statum similiter transire vel in generali vel in speciali; in generali ut saltem remanens in saeculo voveat castitatem, altero ad religionem transeunte; vel in speciali, scilicet ut non solum castitatem voveat sed etiam habitum religionis accipiat sicut alter. Haec est ergo ratio quare de consensu potest alter ad religionem transire.

Sed quod quaeritur si potest in saeculo alius remanere, hic est distinguendum, quia aut est talis qui remanet in saeculo quod non potest de ipso haberi suspicio fornicationis vel incontinentiae, et sic sufficit vovere castitatem, Extra. De convers. coniug. Cum sis, Verum; vel etiam talis de quo potest haberi suspicio utpote iuvenis vel talis quod laevitas supleat iuventutem, et tunc non sufficit vovere in saeculo remanendo, sed oportet talem religionis habitum recipere vel alter de consensu illius non poterit ad altiora vota transire ex quo facti sunt una caro per copulam carnalem. Haec dispositio habetur plane Extra. De convers, coniug. Uxoratus[97], I et II insimul, et secundum hanc distinctionem intelligenda sunt iura ad utramque partem adducta.

Ad tertium casum duplex est opinio. Quidam dicunt quod quia licitum est eis illud implere, et licitum fuit iuramentum, non potest sine nota periurii ad religionem transire. Sed ex hoc sequeretur quod matrimonium possit sine carnali copula fieri indissolubile, et ita sine carnali copula consummari, quod est contra saepe allegatam decretalem, Ex publico[98], in cuius fine dicitur quod per solam carnalem copulam matrimonium consummatur. Propter quod aliter dicimus secundum

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[96] c. 7, Ex publico, **X**, De convers. coniug. III, 32 (II, 580).
[97] c. 8, Uxoratus, **X**, De convers. coniug., III, 32 (II, 581).
[98] c. 7, Ex publico, cf. *supra* n. 96.

Hugonem[99] quod in tali casu potest quilibet illorum sine nota periurii ad religionem transire, quia maius bonum est istud quam stare in tali matrimonio, et qui minus bonum dimittit propter maius non trans-
25va greditur, imo e contrario, | XX, Q. III, Propositum[100]. Unde minus bonum in meliori impletur.

Quod in contrarium obicitur quod omnibus licet renuntiare iuri suo, est ius hominis duplex, scilicet hominis in se, et de tali loquuntur iura inducta, et ius hominis in comparatione ad Deum, et tali iuri non potest homo licite renuntiare. Et ideo si renuntiet stulte, consulte vadit contra talem renuntiationem, ut v. g. si iste iuret non ire ad Ecclesiam, non dare eleemosynam pauperi, licitum est ei facere contra, quia ad hoc se non potuit obligare, immo peccavit.

Consequenter quaeritur, ponitur quod contaxit cum isto per verba de praesenti, non vult reddere debitum, sed dixit quod vult vivere caste, nec tamen vult transire ad religionem, sed in domo patris vel sua in saeculo vult castam vitam ducere, cogenda est reddere debitum vel intrare religionem?

Videtur quod non, quia fortius vinculum a minori absolvit.

Contrarium habetur ex saepe alligata decretali, Ex publico instrumento[101].

Respondeo. Non potest sic remanere in saeculo, quia consentiendo in virum et ad continentiam coniugalem se ligavit, et se alteri subiecit, et alterum fecit caput suum, cui obedire tenebatur. Quia ergo semel caput habuit acephala, in saeculo remanere non potest, sed oportet quod ad religionem transeat nisi caput spirituale habeat, si non vult habere carnale, aut marito debitum reddere, et ei sicut suo capiti in his quibus debet obedire.

Quod ergo obicitur, verum est quod si non esset in consensu coniugali ligata, bene procedit ratio quod maiori castitate bene recompensaretur, sed ibi vel ubi est obedientiae vinculo alligata, et in saeculo non esset sub obedientia, et ideo ratione obedientiae annexae est illud bonum minus quam illud, quia melior est obedientia quam victimae[102].

Consequenter quaeritur ratione eius quod in illo capitulo, *His autem itaque respondemus*[103], dicitur quod illi inter quos non sunt nisi sponsalia, possunt eligere religionem et continentiam profiteri sine consensu alterius. Unde supponit sponsalia esse solubilia, et de hoc quaesitum est

[99] Non inveni.
[100] *Decret. Grat.* c. 1, Propositum, C. XX, qu. 3 (I, 848).
[101] *Cf.* n. 96.
[102] Eccles. 4, 17.
[103] *Cf.* Lombard *IV Sent.*, Dist. XXVII, (ed. cit. II, p. 921).

supra. Sed hic quaeritur magis specialiter utrum infra aetatem legitimam, in tempore illo medio debito sponsalibus, pone quod sicut supra septem et infra quattuordecim ex parte viri, et duodecim ex parte mulieris, possunt se invicem quittare, et in saeculo remanere, et contrahere cum aliis?

Quod sic videtur, quia si aliis pactionibus possint se quittare, promittentes infra tempus solutionis, ergo et hic infra aetatem legitimam ad contrahendum.

Contra. Quia sicut se habet tempus illud ab aetate legitima et deinceps ad matrimonium, sic a septimo anno usque ad aetatem legitimam se habet ad sponsalia. Ergo, sicut in illo numquam possunt se legitimi coniuges quittare sibi invicem consensum in matrimonio, sic nec in tempore determinato sponsalibus poterint se quittare de sponsalibus contractis inter se.

Respondeo. Hugguccio[104] dicit quod non possunt, et secundum illud dicimus quod non possunt, quia huiusmodi pactio ordinata est respectu alicuius indissolubilitatis, et ideo ipsa indissolubilis debet esse. Non tamen haec est ratio proxima, sed ratio quare sic videtur quia illud tempus impubertatis decretum est sponsalibus sicut tempus legitimae aetatis matrimonio. Unde sicut in illo tempore non potest consensus de praesenti quittari, sic nec in isto consensu de futuro, quia totum illud tempus debetur sponsalibus sicut totum illud maritali consensui. Unde ad consimilem actum est irregularis in toto isto tempore; unde volunt iura quod si tunc contrahunt sponsalia cum alia totum sit neutrum.

Quod ergo obicitur de aliis pactis non est simile, quia nec illae pactiones ordinantur ad aliquid indissolubile sicut illa pactio, et quod maius est, in eis non facit homo sibi legem sed legi iam factae se subiecit, quia dico quod est lex hominis respectu hominis, quam homo sibi facit, et totum est ibi ab homine, et ideo de consensu hominum potest totum dirimi. Sic est in aliis promissionibus. Et est lex hominis ad hominem quam ille qui legi illae se subicit non sibi facit. Unde se illi subiacere est in potestate sua. Sed postquam se subiecit, quia non illam legem facit non est suum contra illam legem ire, quia illam non potest removere. Sic est in pactione de matrimonio contrahendo, quia iura volunt quod qui cum ista contrahit sponsalia, non possit cum alia, sed cum illa matrimonium impleat sicut promisit, et ideo isti qui tali legi voluntarie se subiecerint non possunt pro voluntate sua iugum legis huius a suis cervicibus removere.

[104] *Cf.* apparatus, ed. Venetiis, 1584, col. 1462.

Sed tunc quaeritur si cum ad aetatem legitimam pervenerint, possunt se quittare?

Quod non possint videtur per illud Ca. XXXI, Q. III, Si qui parentes[105]. Ad idem facit Extra. De spons., id est, Praeterea[106], quamvis in superficie videatur facere ad contrarium, tamen facit pro hoc si fiat vis in verbis quae ibi dicunt "ne forte deterius" etc. Et videtur quod his possunt in patientia tolerari, quia ex hoc sequitur quod illud sit malum, scilicet quittatio talis, quia de illa ibi loquitur.

Respondeo. Credo quod non possunt se invicem quittare quia promissio illa de futuro ita respiciebat tempus aetatis legitimae quod tantum valet acsi diceret "Cum venerit tempus aetatis legitimae ero contrahens tecum in actu, id est, tunc dicam tibi, "Contraho tecum", et ita cum venerit iam illud in quo debet impleri hoc, scilicet "Contraho tecum", ratione illius debet ista promissio indissolubilis iudicari, quia tempus quo debet verti in praesens iam advenit secundum illud quod dicit lex quaedam[107] ubi sine termino promiserat illud, scilicet matrimonium contrahendum in aetate legitima, quam cito tempus aetatis legitimae advenerit tam cito illud reddere tenetur, nisi rationabili ex causa hanc dimittat.

Sed tunc quaeritur si sponsalia sint indissolubilia quare illi qui contraxerint non compelluntur per censuram ecclesiasticam illa implere sicut qui contraxerunt per verba de praesenti compelluntur, quia talis copula indissolubilis est secundum iura? Quaeritur etiam, si indissolubilia sunt de iure sponsalia quare admittatur contrarium et iudicatur pro illo, scilicet quando post sponsalia cum una contrahitur per verba de praesenti cum alia, iudicatur pro matrimonio et non pro sponsalibus? Quia videtur quod non debet fieri, quia si ille contrahit cum ista per verba de praesenti, et post similiter cum alio, etiam subsequente carnali copula iudicatur pro priori vinculo et secunda irritatur obligatio, Extra. De Spons. Ex parte mulieris, et eodem titulo Cap. Si inter[107a] et hoc quia prima obligatio fuit indissolubilis; ergo, a simili, si hoc fuit indissolubilis, scilicet obligatio sponsalium, videtur quod omnis obligatio subsequens, sive de praesenti sive de futuro, irrita fit et nulla.

Respondeo ad primum dico quod verum est quod sponsalia de se sunt indissolubilia. Tamen non coguntur ab Ecclesia adimpleri nisi aliquando videat iudex expedire aliqua decreta. Et hoc quia non tenetur

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[105] *Decret. Grat.* c. un. Si qui parentes, C. XXXI, qu. 3 (I, 1115).
[106] c. 2, Praeterea, X, De spons, et matrim. IV, 1 (II, 661).
[107] Non inveni.
[107a] c. 9, Ex parte, X, De spons. et matrim., IV, 1 (II, 663), and c. 31, Si inter, X, De spons. et matrim., IV, 1 (II, 672).

simpliciter iudex facere illa teneri, sicut iam dicitur, et ideo non cogit necessario ad illa tenenda. Una ratio est ne deterius inde contingat, scilicet, ne iste talem ducat quam odio habeat, et sic eam non vellit matrimonialiter tractare, et propter hoc tolerat Ecclesia quod non impleant sponsi quod promiserunt, ut habetur Extra. De sponsalibus, ibi, Praeterea[108]. Alia ratio est quia coniugium est sacramentum amoris et copula est amoris, et ex amore debet procedere, non ex violentia aliqua, Extra. De spons., Cum locum, Requisivit, Gemma[109], habetur de hoc, et propter hoc ecclesiasticus iudex non cogit tales necessario. Cogit tamen aliquando quamvis non teneatur ratione sponsalium simpliciter illos cogere. Illas autem qui per verba de praesenti contraxerunt semper cogunt, quia semper tenentur si personae sint legitimae, et ratio huius potest dici quia est lex quae immediate et proprie vel a Deo instituta, quaedam etiam magis ab homine imposita, consona tamen non contraria Deo. Prima est de consensu matrimonii; secunda vero est de sponsalibus. Non enim legitur Deus legem dedisse de sponsalibus sicut de matrimonio legitur, sed magis homo illas instituit propter rationes aliquas, et quia iudex est loco Dei, Deut. I, "Dei iudicium est"[110], et II Par. XIX, dicitur ad iudices, "Videte quid faciatis, non enim hominis exerceris iudicium sed Dei[111]," Cum etiam ipse iudex illi legi sit subiectus, nec habet potestatem super illam, et ideo dissimulare illam non potest, nec contra illam permittere agi si sibi innotescit in iure. Et propter hoc semper pro illa lege et pro matrimonio iudicat. Sed quia lex sponsalium erat magis ab homine, ideo homo potest illa dissimulare et non cogere illa impleri auctoritate prima Summi Iudicis in terra, scilicet, Domini Papae, qui de hoc dat licentiam iudicibus, ut videtur De spons. ibi, Praeterea[112].

Ad id quod postea quaeritur quare velet consensus de praesenti cum alia plus quam cum alia quacum contracta sunt sponsalia, dicatur quod aliquid est indissolubile ab homine actu et potentia, et huiusmodi est matrimonium, et aliquid est indissolubile ab homine actu sed non potentia, imo potest ab ipso dissolvi. Intellige tamen de facto non de iure, et huiusmodi sunt sponsalia, et ideo ad hoc potest dici quia promissio de futuro, quia respicit futurum nec habet veritatem nisi futuram, id est pro futuro, non dicit immediatam causam matrimonii, et propter hoc

[108] c. 2, Praeterea, X, De spons. et matrim., IV, 1 (II, 661).
[109] c. 14, Quum locum, X, De spons. et matrim., IV, 1, (II, 666); c. 17, Requisivit; c. 29, Gemma (ibid. col. 667, 671).
[110] Deut. 1, 17.
[111] II Par. 19, 6.
[112] c. 2, Praeterea, X, De sponsalibus et matrim., IV, 1 (I, 661).

ad ipsam potest non sequi matrimonium, tamen ordinate de iure se-
25vb queretur, | quia ad hoc ordinantur verba illa, ut postmodum dicantur alia quae immediatam causam matrimonii important. Et propter hoc sponsalia si actu non dissolvantur, tamen dissolubilia sunt propter hoc quod non dicunt necessitatem ad matrimonium, sed congruentiam et ordinationem. Consensus autem per verba de praesenti est immediata causa matrimonii, et necessaria, ad quam de necessitate sequitur matrimonium. Et propter hoc indissolubilis est ista copula, quia sic transit dominium consentientis, non transit in verbis de futuro, sed adhuc est suus de facto, etsi non de congruentia iuris. Et propter hoc de facto etsi non de iure se potest dare alteri; in consensu de praesenti transit dominium et de iure et de facto, et ideo post se non potest alteri dare, nec promittere nec de iure nec de facto auctoritate sua, nec aliqua nisi divina dum tamen legitimae sint personae, et propter hoc post contractum sponsalium cum ista tenet matrimonium contractum cum alia.

Ultimo quaeritur de hoc quod dicit Magister[113] in illo capitulo, "Et est sciendum si quis ducat relictam alterius tamen incognitam ab illo primo viro, post mortem uxoris promoveri ad sacros ordines non potest, quia viduam duxit, et sic sit quasi bigamus et irregularis?"

Quaeritur ergo utrum verum sit quod dicit Magister, quod similiter videtur haberi XXVII, Q. II, Quod interrogasti, Ecce[114], et inde accipitur quod Magister dicit?

Secundo, quia iudicium humanum debet sequi divinum, sed quoad iudicium divinum ipsa est corrupta. Unde non habebit aureolam si statim post mortem primi coniugis decedit, quamvis non cognovit. Ergo, debet similiter ab hominibus iudicari corrupta. Ergo, de eo qui contrahit cum illa debet iudicari ac si fuisset a viro corrupta, et ita non poterit post mortem uxoris promoveri.

Contrarium videtur XXXIV, Dist., cap. Valentino[115].

Praeterea, sicut eodem capitulo Valentino dicitur, illa est virgo; ergo, cum nubat cum ipsa duxit virginem. Sed maritus qui habuit virginem, nisi aliud impediat licite potest post mortem illius promoveri. Ergo etc.

Respondeo. Non est verum quod dicit Magister in hoc loco, nec sustinetur communiter. Ad quod notandum quod vidua dicitur tripliciter, proprie, communiter, et improprie. Proprie dicitur vidua cuius maritus est mortuus, et fiat vis in hoc nomine maritus, id est, maris exercens

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[113] Cf. Lombard, *IV Sent.*, Dist. XXVII (II, p. 924).
[114] c. 29, Quod autem interrogasti, C. XXVII, qu. 2 (I, 1071).
[115] c. 20, Valentino, Dist. XXXIV (I, 130).

ritus, qui maris ritus exercuit cum illa eam carnaliter cognoscendo, de qua Dist. XXXIV, Vidua[116], et definitur ibi sic, "Vidua est cuius maritus mortuus est," Et copula talis viduae promotionem ad sacros ordines impedit, Dist. XXXIV, Si quis viduam[117]. Secundo modo dicitur vidua communiter sive minus proprie, id est, a viro idua, id est divisa, id est cuius vir, id est iste qui cum ea contraxit sed eam non cognovit, mortuus est. Ex copula huius viduae nullus repellitur a promotione, Dist. XXXIV, Valentino clerico[118], Extra. De bigamo, Proprie debitum[119]. Tertio modo dicitur vidua quae a marito vivente divisa est quoad carnalem copulam promissa continentia ab utrisque, ut sunt uxores presbyterorum apud nos, Dist. XXXII, Mulieres[120]. Sic uxores apostolorum viduae dicebantur. Sic accipitur vidua Act. VI, "Factum est murmur Graecorum adversus Hebraeos eo quod dispicerentur viduae eorum in ministerio quotidiano[121]." Sic et uxores illae decem Davidis viduae dicuntur II Reg. XX[122], "Cum venisset rex in domum suam in Ierusalem, tulit mulieres decem concubinas suas, quas relinquerat ad custodiendum domum, et tradidit eas in custodiam et alimenta eis praebens, et non est ingressus ad eas, sed erant claustrae usque ad diem mortis suae in viduitate viventes".

Quod ergo dicit Magister de vidua primo modo ducta verum esset, sed de secundo modo dicta non dicit verum propter rationes in oppositum adductas.

Ad decretum ergo quod inducitur pro Magistro dicatur quod capitulum loquitur de vidua primo modo dicta. Aliter contradiceret causa XXXIV Dist., Valentino[123].

Ad aliud maior integritas et incorruptio exigitur in muliere ad hoc quod haberet aureolum quam ad hoc quod eius copula non impediat promotionem mariti sui, quia ad aureolam exigitur quod sit integra corpore vel ad minus quod numquam voluntarie corruptioni corporis sequenti de facto consenserit, quia si violenter corrupta esset etiam a proprio sponso in sponsalibus ante matrimonium contractum, propter hoc perderet aureolam. Et etiam exigitur cum hoc voluntas perpetuae continentiae, et sic integritas mentis exigitur.

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[116] c. 16, Vidua, Dist. XXXIV (I, 129).
[117] c. 13, Si quis viduam, Dist. XXXIV (I, 129).
[118] *Cf. supra* n. 115.
[119] c. 5, Debitum, X, I, 22 (II, 147).
[120] c. 19, Mulieres, Dist. XXXII (I, 122).
[121] Acts 6, 1 ff.
[122] II Kings 20, 3.
[123] c. 20, Valentino, Dist. XXXIV (I, 130).

Ad hoc autem quod maritus eius possit promoveri non exigitur integritas mentis, quam illa non habet, quae cum praecedenti coniuge et cum isto in carnalem copulam consentit, et simpliciter consentit, sed solum exigitur integritas corporis, non continentia. Sed quando illam ducit, quia quod ille postmodum illam cognoscit non impedit quin promoveri possit; dum tamen virgo esset, id est integra corpore, cum illam primitus cognovit, et postmodum illam, si forte ab alio cognata est infra matrimonium, scienter illam non cognoscit *(sic)*. Unde quantum ad iudicium divinum talis coniux simpliciter corrupta non iudicatur, sed non integra integritate quae exigitur ad aureolam. Iudicatur tamen integra et integritate quae sufficit ad hoc quod post mortem suam vir eius superstes post promoveri possit.

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BOOK REVIEWS

The Holy Bible: Volume III, The Sapiential Books — Job to Sirach. Sponsored by the Episcopal Committee of the Confraternity of Christian Doctrine. Paterson: St. Anthony Guild Press, 1955. Pp. viii—710. $ 5.00.

The Psalms. Fides translation. Introduction and notes by Mary Perkins Ryan. Chicago: Fides Publishers Association, 1955. Pp. xxxvii—306. $ 3.95.

Since "Divino afflante" Scriptural translation has flourished. The variety thus introduced impels choice based on principle. This writer prefers the English Bible in contemporary prose, intelligibly literal, unshackled by memories of Douay, undeceptive where the text is obscure.

The Psalms — the common ground of these two new books — have garnered eleven English versions in as many years, eight from the new Latin Psalter, the rest from the Hebrew. Confraternity, familiar from its separate publication in 1950 and scarcely changed in the new edition, belongs to the latter group but has elected the new Psalter's rendition in various difficult passages, specified its departures in footnotes. Fides, asserting its origin in the new Psalter, frequently evidences independent scholarship, borrowing a phrase from Confraternity in Ps 78:8, departing from both in Ps 57:10. The prose, contemporary in both, will not gratify one who must address God by a pronoun lacking in modern English; Confraternity preserves a flavor of tradition, nonetheless, while Fides exhibits a tilt of song discernible elsewhere only in the paraphrastic versions. Both translations demonstrate that a literal version need not be less intelligible than a paraphrase. Neither one will remind of Douay. Fides smooths over textual obscurities of the original which Confraternity lays bare by bracket and footnote.

As for competing versions, Kleist's modern English is the poetic sort, rendering the thought opaque; the euphony he sought can be had in Fides without his sacrifice of clarity, his inverted word order, his baleful "'tis" and "o'er." On the other hand, for one who prefers paraphrase, Kleist supersedes Knox, which was a hasty and inadequate adaptation to the new Psalter of a translation made from the Vulgate; the latter is striking, original, but illuminating rather in the manner of a commentary than of a good translation; some parts of the Knox Bible are far more successful than his Psalms. Kissane, neither modern in diction nor yet too archaic, bolstered by critical apparatus and lengthy commentary, is the most individual of all because his textual criticism is the most radical and his strophe divisions — never identical in two versions anyway — are seemingly arbitrary if always elucidating. Callan,

disappointing, is literal and archaic; it could be mistaken for Douay. Benziger and Frey, both very widely circulated, are as inadequate as they are popular, for their mutual sin is the cardinal one of inexactitude.

Either Fides or Confraternity would be surpassing, lacking the other. For comprehension of the new Psalter, Fides is peerless. As part of a complete Bible, Confraternity brooks no cavil. The scholar will want both, should not lack Kissane, and may find Kleist intriguing. But considering the Confraternity volume as a whole, the other six books — Job and the Wisdom books — are the elements which assure full value to its owner. One volume of the complete Confraternity Bible, Genesis to Ruth preceded it and the Prophets are due shortly; the remaining historical books and the New Testament are scheduled after that. Modern in diction against the antique Westminster and the compromise Knox, Confraternity has no real competitor among complete English Bibles. The first two tried to clarify Job, but did they succeed like this? The Wisdom books, like Job and Psalms, in the original are poetry, a quality not lost here. Whether Canticle is a drama, however, might have been settled with less finality; the more common theory — that it is a collection of songs — might have been at least acknowledged.

The typography of both volumes is superb beyond all earlier works. Fides, lacking the fine notes and critical apparatus of Confraternity, supplies a thirty-page introduction directed to laymen, marred by an unsatisfactory explanation of the pseudo-word "Jehovah." Its English is not enhanced by "sheol" untranslated, and some may miss the omitted verse numbers, but these do not disable a splendid work.

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Nevins, Albert J., M. M., *St. Francis of the Seven Seas*, New York [1955]; 184 pp.

This biography of St. Francis Xavier appears in the Vision Books Series "designed to acquaint youngsters from nine to fifteen with the lives of great Catholic saints, martyrs, and lay figures," It informs them about history and geography as well as inspires them with spiritual heroes.

The author, who has traveled throughout Central and South America, and the Middle East, writes from his own experiences as well as research. Father Nevins has also written six juveniles about children and numerous articles for Catholic periodicals and newspapers.

The story: Francis Xavier was born April 7, 1506 although he appears in the story at the age of six. After the death of his father, Don Martin, the youth studied at the University of Paris where he received his degree. With his room-mate, Peter Fabre, he joined Ignatius Loyola as the first members of the Society of Jesus. After ordination on June 24, 1537, Francis sailed to India. Later the Governor of Sousa urged him to visit the Paravas. Francis instructed these Christians and baptized their cildren. Next, he sailed to Malaya unmindful of the fierce pirates. In May, 1546 Francis proceeded to

the Spice Islands, residing in a poor hospital where he cared for the sick. Hearing about Japan, the saint left the islanders in 1549. After a stormy trip under a difficult captain, Francis arrived at Kagoshima. He later proceeded to Hirado and Kyoto, but after eleven days, the disappointed missionary returned to Hirado. In November, 1551, the Jesuit priest returned to India. After two months in Goa, Francis decided to convert China. But on December 1, 1552 Francis died on Sancian Island before he could realize his ambition for Christ and the Church. Ultimately his body, miraculously preserved, was returned to Goa. On March 12, 1622 he was listed among the saints.

The attractive cover, large type and short chapters (fifteen in number) should appeal to youthful readers. Although full page illustrations are lacking, the motif of each chapter is graphically illustrated. A map of Francis' travels graces the front and back inside covers.

The story itself, briefly sketched above, will fire the imagination in presenting the dynamic personality of St. Francis Xavier. There are many points of high interest, especially his meeting with Ignatius Loyola, his miraculous powers on the Spice Islands and his clever diplomacy in dealing with the daimyos of Japan.

Those interested in Catholic Action will be pleased to note Francis' action in delegating children to teach the catechism. "He did not wish to refuse the people entirely, so he sent the children whom he had taught to the homes of the sick. He told them to gather family and neighbors and recite the prayers they had learned."

We believe the author has presented Francis Xavier as a human being, popular and worthy of imitation. The holiness and confidence in God of the saint are sufficient evidence that the book is wholesome. This reader found it difficult to set aside St. Francis of the Seven Seas until the last page was finished.

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5. **The De Primo Principio of John Duns Scotus. A Revised Text and a Translation.** By Evan Roche, O. F. M. 1949. $2.00 (Exhausted; new edition in preparation)
6. **The Psychology of Love According to Saint Bonaventure.** By Robert P. Prentice, O. F. M. 1951. $1.00
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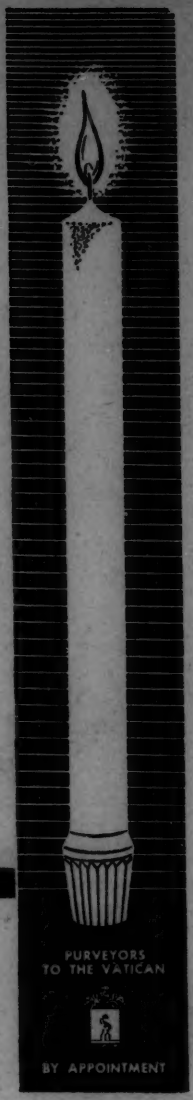

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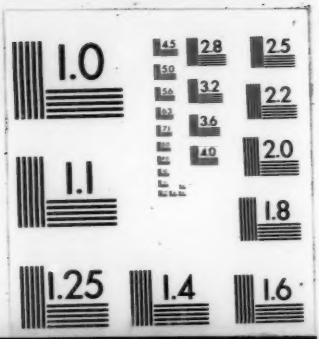
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